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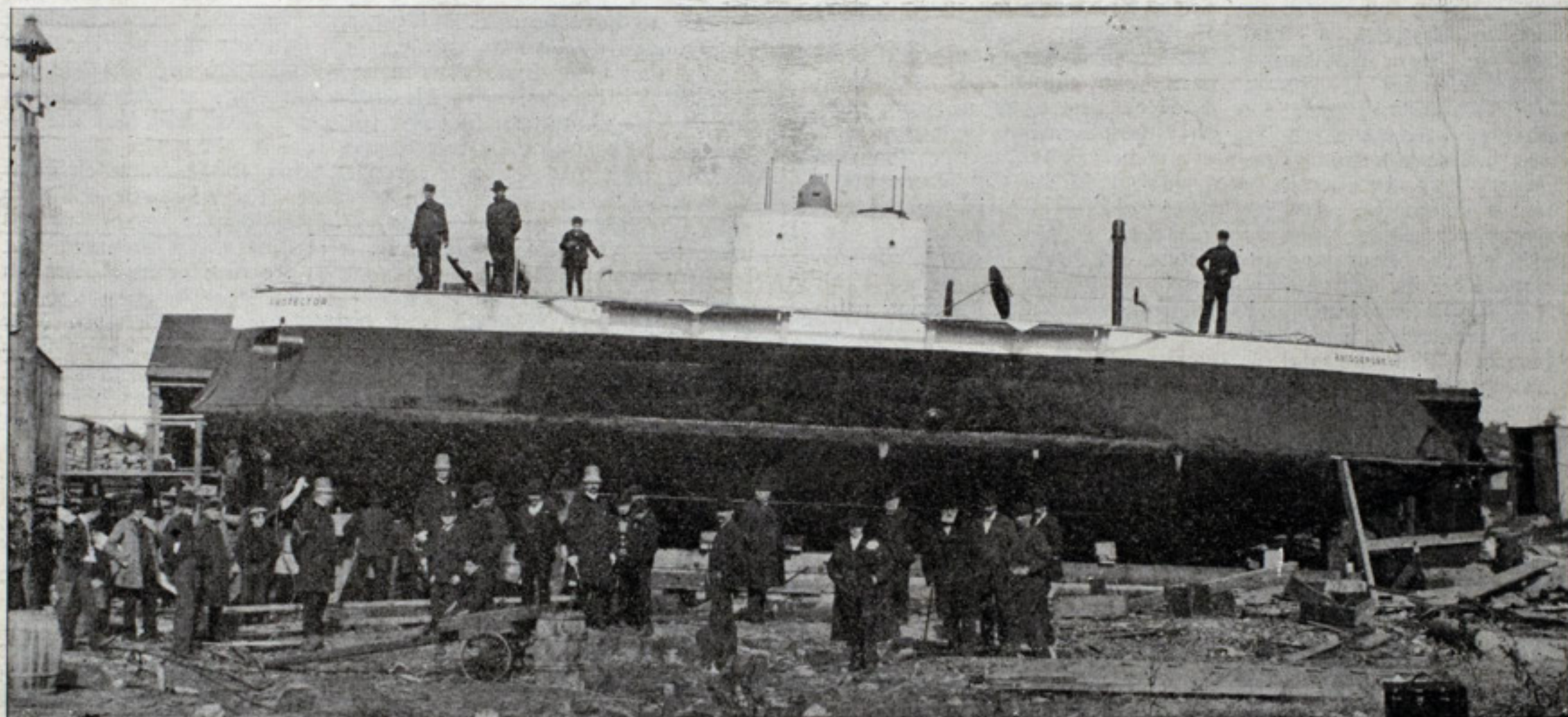
No. 3

SUBMARINE TORPEDO BOAT PROTECTOR.

The accompanying illustration shows the submarine torpedo boat, Protector, which was launched on Nov. 1, last, at Bridgeport, Conn. She is modeled after Argonaut No. 2, which in turn was a modified copy of Argonaut No. 1, launched in 1897. The inventor is Mr. Simon Lake of Bridgeport. The Protector is not cigar-shaped, like almost every other submarine torpedo boat, and the reasons are the result of her builder's experience in waters disturbed by heavy seaways. Photographs of the cigar-shaped boat while under way awash show them laboring even in smooth water, with the weight of water bearing down upon their turtle-backs. With a displacement rapidly decreasing after the major longitudinal axis is submerged, the tendency is to "bury" in a seaway, and this fault becomes no less serious when submerged, for it has been discovered from experiments made with the Argonaut that the heavy ground swell after a storm reaches a depth of 5 or 6 fathoms in effect, and has a tendency to beat

drums by wire rope. When the point of submergence is reached, and the boat is designed to work to a depth of 150 ft., these weights are lowered, the buoyancy of the boat is reduced to that of the awash condition, and then she is bodily hauled down. The object of this is to prevent too rapid a descent. Another reason for this mode of submergence is that it is possible to take accurate bearings and sink the craft in this way within a few feet of any chosen point. For running between the surface and the bottom the boat has to depend upon the lateral hydroplanes and the vertical rudder at the stern. This is an experimental feature about the new boat, for others of this type ran only on the surface or on the bottom, not in between. The boat carries a heavy cast iron keel, a large section of which can be dropped at will in case of accident on the bottom.

The boat is 65 ft. long over all, has a maximum beam of 11 ft., and submerged displacement of 170 tons. She has twin-screws, driven by two gasoline engines of 250 H. P., applied direct



Launch of the Lake Submarine Torpedo Boat Protector.

down upon a submerged craft. The Protector, like her prototype the Argonaut No. 2, has a ship-shaped hull, which consists inwardly of a cigar-shaped body, with the ship-shaped formed superstructure riding above without. In the ship-shaped superstructure are placed the air tanks and the gasoline storage. This effects a double end. In the case of the air tanks it tends to lower the center of gravity, while with the gasoline tanks outside the main body of the boat an element of added safety is secured in case of their leakage. On the deck, amidships, is placed an elliptical conning tower, and above that rises an armored sighting hood. With deck awash, the conning tower is nearly all above water, while for closer observation the boat is submerged to the armored sighting hood, three seconds' time, it is said, being required to effect the change. With the sighting hood above water, the boat has, it is stated, a reserve buoyancy of only a few hundred pounds, so that total submergence when under way can be effected quickly by the operation of the hydroplanes at the sides in line with the guards. In addition to the hydroplanes, there is a third rudder aft for vertical control, and, of course, one for horizontal direction.

To travel on the bottom, all that is said to be necessary is to effect total submergence, when the boat, on reaching the water bed, will settle upon her two traveling wheels—one forward of the other on the keel line. These wheels are so arranged that they have considerable vertical play, and they are housed to some extent within the body of the keel when not in use. They are raised and lowered by pneumatic lifts, which, when the boat is running on the bottom, tend to act as buffers against the effect of a heavy ground swell. For anything but very moderate submergence the builder recommends that the boat be drawn down to the water bed. To effect this the boat carries two pyramidal weights, or anchors, weighing 1,000 lbs. each. These weights are usually housed within the keel and are connected to power

to shafts. For submergence runs, she carries storage batteries, with capacity equal to 100 H. P. The batteries can be re-charged while the boat is running under her gasoline engines. There is said to be ample space for a crew of six, folding berths, like the bunks in a Pullman sleeping car, being provided for that purpose and turned up out of the way when not in use. The engines are placed to the sides of the boat, leaving a passageway between them. The surface speed is estimated at 11 knots and the submerged at 7 knots. The fuel tanks hold 1,400 gallons of gasoline. Enough air is carried in the tanks in the superstructure at a pressure of 2,000 lbs. to the square inch, to last, it is estimated, for a submergence of sixty hours. Forward of the living space there is the diving compartment, by which access can be had to the sea when the boat is on the bottom. In this compartment is carried a telephone, which connects with the other parts of the boat, and which can also be connected to an outside line. The object of this latter use is for off-shore picket service. It is proposed that boats of this type shall be sent well out to sea, where the bottom is still not more than 100 ft. below (on the Atlantic coast of the United States this ranges all the way from 5 to 20 miles), and when an enemy is observed in the offing, after having marked his apparent speed and direction, sink to a junction box, send out the diver, and make direct telephonic connection with the shore. By gradually increasing the air pressure in the diving compartment, during the interval of hauling down, it should be possible to bring the diver to the point of pressure needed without danger.

The wheels of the Protector have a central blade, intended to bite into the bottom, which on the Atlantic coast is generally hard sand, and to keep the boat true to her course. Cyclometers are to be geared to the traveling wheels to check distances.

In a recent trial the Protector behaved admirably and made good time.

GENERAL INQUIRY INTO SUBSIDIES.

(From Special London Correspondent.)

London, Dec. 31.—The eight recommendations of the subsidies committee have already been published in the Review. Naturally before reaching these conclusions the committee had to inquire generally into the giving of subsidies. While they do not say so, it is quite clear that the committee is not generally favorable to the policy of giving subsidies and regards its observances as one without system. The figures given as to the bounties paid by various nations are interesting. Thus Great Britain pays \$3,782,500 a year in addition to the \$750,000 per year just granted to the Cunard company. Moreover British Admiralty subsidies amount to \$389,065. Germany gives an annual subsidy of \$825,000 to the North German Lloyd for its East Asian service and \$575,000 for its Australian service and to the German East Africa Co. \$337,500 a year for a South African service. These sums, totaling \$1,737,500, make up the total of German state subsidies, in addition to \$325,000 paid annually by the German post office to the Hamburg-American and North German Lloyd companies for the carriage of German mails from Hamburg and Bremen to America. There are one or two other small payments that need not be specially noticed. The French voted in their budget of 1901 \$5,336,355 as postal subsidies. In addition there are bounties for construction amounting to \$1,160,000, and annual bounties for navigation paid per mile run amounting to \$2,440,000 or a total of \$8,936,355. Russian subsidies paid for the transport of troops, ammunition and passengers in 1899 amounted to \$1,590,305, and for postal services to \$233,475, a total of \$1,823,780. Only one company—the Amur Navigation Co.—receives both non-postal and postal subsidies. Austria pays two kinds of subsidies. The Australian Lloyds Co. receives \$1,110,000 a year (together with \$25,000 a year for parcel post), mainly for postal services, but certain conditions are attached including one that the company may not alter its rates without the consent of the minister of commerce. And a further subsidy is given by the repayment of certain dues, such as those of the Suez canal. In addition, the Austrian government advances large sums of money towards ship building without interest. A second kind of subsidy is one which is called trading and trip bounties, paid to the mercantile marine since 1894, and amounting in 1899 to \$271,400. Thus the total of Austrian subsidies amounts annually to \$1,594,940. Hungary pays total subsidies amounting to \$403,775, but there is no means of calculating what proportion of this sum is special payment for postal services. Swedish subsidies are granted (1) purely for the conveyance of mails, and (2) for the maintenance of steamer communications “in the interests of navigation and trade.” The total amount under both heads is only \$102,955 a year. In Norway the total amount of subsidies is \$141,260, of which \$53,770 is purely postal and \$87,490 “for facilitating steamer communication.” In Denmark the subsidy is \$148,345 a year. The Danish government is of opinion that this is only fair remuneration for actual services rendered. In Japan the system of subsidizing has developed immensely, practically since 1897. The principal amounts authorized in 1898 for particular services included \$1,364,795 to the Nippon Yusen Kaisha for the European line, \$333,825 to the same company for the Seattle line, and \$517,500 to the Toyo Kisen Kaisha for the San Francisco line. In addition to these, increasing annual sums are paid for construction and navigation bounties. In 1899 the total amount of subsidies was estimated at \$2,923,480. In 1900 further sums of \$296,040 for certain lines to North China and Korea, and \$148,965 for the Yangtse line, were provided. In 1901 a subsidy of \$268,300 was authorized for the Australian line and \$91,250 for the Bombay line, and there are other large subsidies. The average subsidy paid per round voyage from Japan to London and back by the Japanese government is stated to be about \$50,000.

Another line of inquiry of the committee was that into the conditions attaching to subsidies granted by the various governments. Thus Germany insists upon the attainment of certain speeds which are calculated to gain an advantage over competitors, draws most drastic regulations in regard to the employment of German seamen, precludes the sale or hire to foreign countries of subsidized vessels, and insists upon specifying rates of freight. None of these conditions obtain in the British contracts. In general it may be said that the German model is largely followed by other European countries granting subsidies.

From evidence dealing with the extent of subsidies and the conditions attaching thereto, the committee proceeded to inquire into the effects upon British trade of subsidized competitors whose governments have protected their national trade interests more effectively than Great Britain has done. It is only necessary to quote the expressed opinion of the committee themselves upon this point. They say:

“Sir William Ward, British consul-general at Hamburg, who has evidently a great grasp of trade in Germany and its international aspects, says he is told that British merchants trading with the Levant and East Africa frequently find themselves compelled, in the interests of their customers in the Levant and East Africa, to place orders for them with German manufacturers which would be executed in the United Kingdom but for the

impossibility of the British manufacturer competing with the low prices due to the largely reduced rates of freight to those countries. Mr. Elijah Helm, representing the Manchester chamber of commerce, states that the rates of freight from Genoa to the River Plate (Argentina and Monte Video) are so much lower than from Liverpool that the difference is sometimes sufficient to induce Manchester merchants to purchase goods on the continent, especially in Italy and Switzerland, rather than in this country for shipment to the River Plate ports. Thus in June, 1901, the rate of freight on cotton goods from Genoa to Buenos Ayres was 17s. 10d. per 40 cu. ft.; from Liverpool to Buenos Ayres it was 40s. per 40 cu. ft. and these were no temporary rates. On these rates a shipment of Swiss dyed cotton goods was made, value £195. Their freight from Genoa was less than £3 12s., while their freight from Liverpool would have been £8 2s., or 124.38 per cent. more. The witness was assured by the British merchants who placed the order and made the shipment that this difference was sufficient to turn the scale in favor of the Swiss manufacture. Again, at the same date, the New York rate for cotton goods, through the Suez canal to Shanghai, a distance of 13,717 miles, was 27s. 6d. per ton of 40 cu. ft. The Liverpool rate to Shanghai, a distance of 10,669 miles, was 50s. for lightly pressed bales. The difference in favor of the American rate is equivalent to ad. on a piece of cloth costing 8s. 10½d., which is 3.7 per cent. of the total value of the cloth, and this is the measure of advantage derived from the lower freight alone, which the American cotton manufacturer has in the China markets in comparison with his British competitor. The New York rate appears to have been a “fighting rate,” assisted from Hamburg to Shanghai by German subsidy, but, however that may be, it is hardly surprising that between 1893 and 1899 the increase per cent. of British deliveries of cotton sheetings at Shanghai was 6.1, and the American increase per cent. 197.7, and that the respective percentages for cotton drills are in about the same proportion. Mr. Albert Spicer, representing the London chamber of commerce, and engaged in business as a wholesale stationer with warehouses in various parts of the empire, gives another instance. On several occasions it has naturally occurred that his firm has had certain paper stock to procure for its Australian houses, and the question is where can that stock be bought to the best advantage? The rates of freight for paper between New York and Melbourne and Sydney in 1899 to 1901 had varied from 17s. 6d. to 20s. to 25s. a ton; the usual rate between London and Melbourne and Sydney during the same period has been 42s. 6d. per ton of 40 cu. ft. ‘We could have placed these orders,’ says Mr. Spicer, ‘in the home markets for those requirements, as the first cost has been much the same in England as in the United States. Sometimes, in fact, there has been a small difference in favor of the home manufacture, but the difference in freight has been so large that it has compelled us to place the orders in the United States, because, of course, in Australia we were competing with America as well.’ So that the British manufacturers have been the losers and the United States manufacturers have been the gainers in consequence of the higher rates of freight from Great Britain as against the rates of freight from New York. The case of cement is also to the purpose. There is a large demand for cement in China. English cement is cut out by Belgian of first natural quality, shipped by German steamer, entirely on account of the difference in freight. In East Africa, too, orders for cement have been placed with Belgian manufacturers instead of British, but here, apart from cheaper freights, the want of direct British steamship communication has been a very serious drawback. The free on board price of German goods in a great many instances is less than that of British goods. This applies to woolen (Bradford) stuffs and Belgian iron. Sir Alfred Hickman, speaking as the representative of the Wolverhampton chamber of commerce, vouches that orders from our colonies have been placed abroad in the hands of foreign manufacturers in preference to British manufacturers, owing to these cheaper rates of freight, and thinks that the tendency has been to shift the market to the continent. Other witnesses have also been of the same opinion. Evidence has been given to show that trade has not been lost to any great extent, and the cheaper rates of freight were chiefly fighting rates during freight wars. The Glasgow chamber of commerce has expressed its very carefully considered view that ‘there is no doubt that the bounties and subsidies paid by foreign governments have enabled lines of steamers to be established that otherwise would not exist, and (especially where subsidies are given according to mileage run) have enabled greater frequency of service and cheaper rates of freight to be given, and, in consequence, orders which otherwise would have come to this country for execution have been placed abroad.’ Your committee agree with this view.”

The committee also points to the fact that British regulations upon British ships in British waters are more severe than upon foreign ships in British waters, especially as regards the load line regulation. Light dues are also touched upon, the major portion of which, of course, are borne by British vessels.

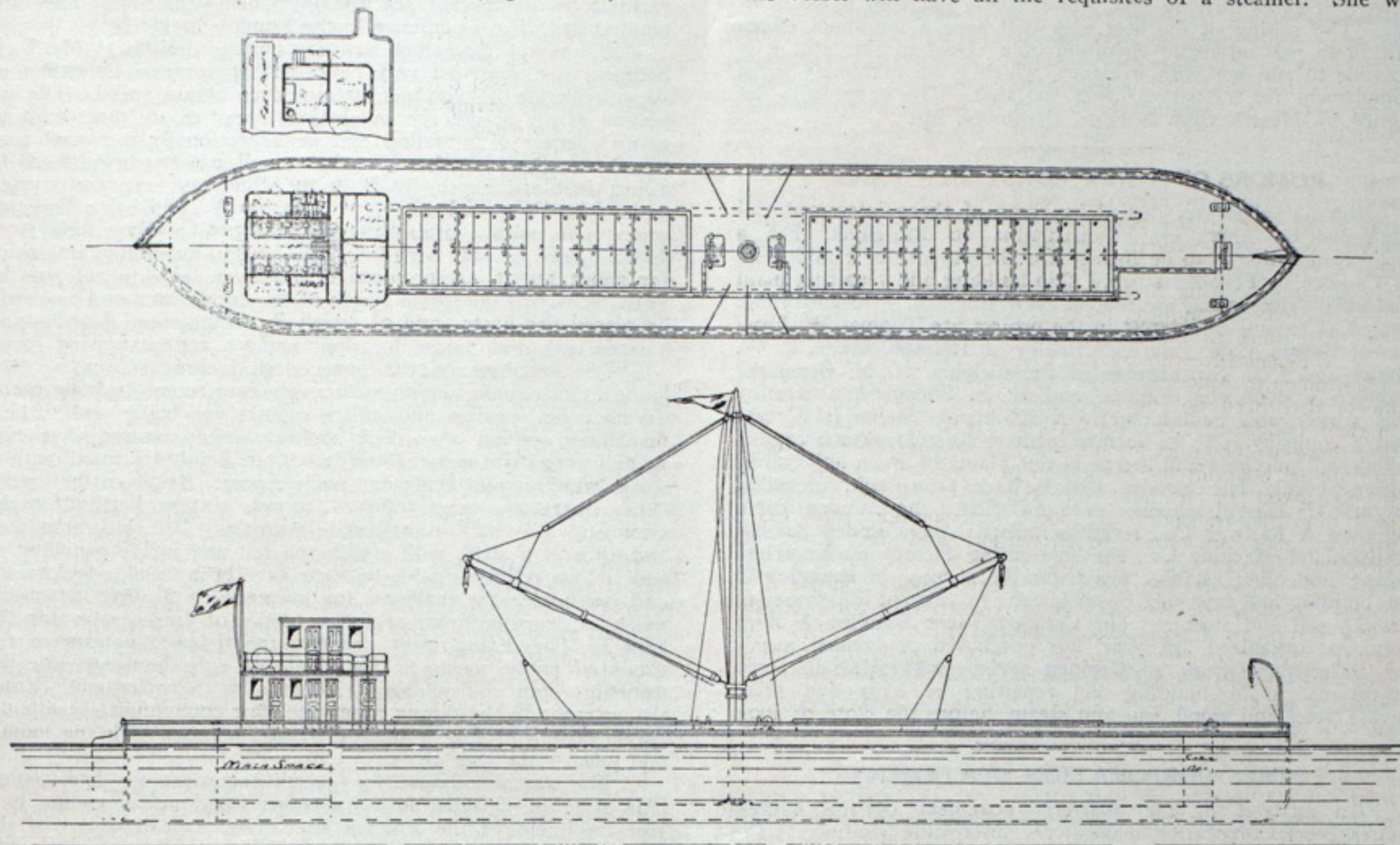
The United States senate has passed a bill to provide a new revenue cutter for the Maine coast.

POWER BARGE OF NOVEL CONSTRUCTION.

Mr. E. J. Tull of Pocomoke City, Md., has taken a contract to build for the Atlantic Power Barge Co. of Baltimore a barge of the following dimensions: Length over all, 168 ft.; length between perpendiculars, 160 ft.; beam, molded, 23 ft. 2 in.; beam

on top and the usual outfit and handling gear will be supplied.

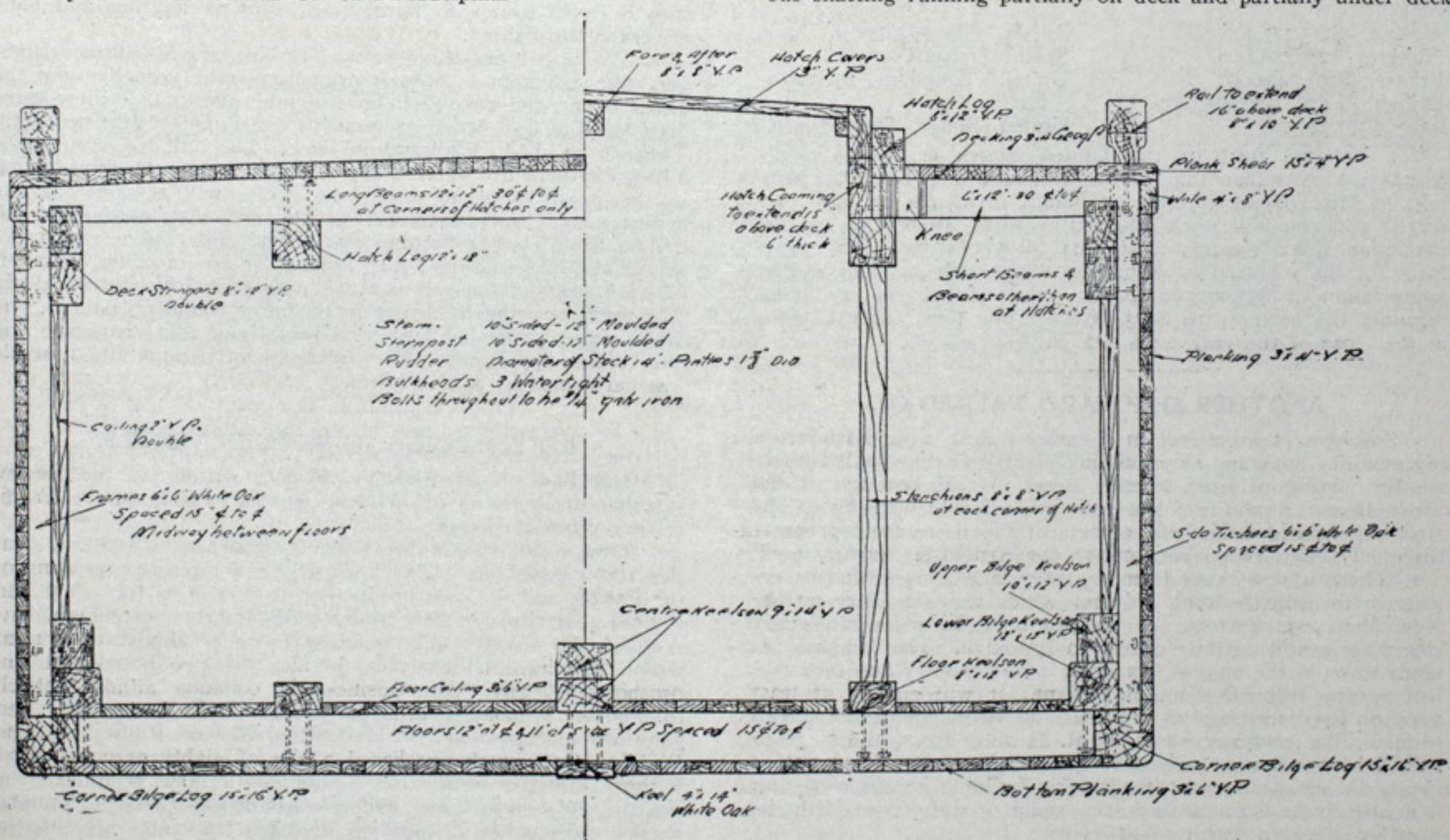
A novelty in the construction of this vessel will be two large hatches, each 34 ft. in length, to permit of rapidity in the work of loading with the minimum of trimming. Although a barge the vessel will have all the requisites of a steamer. She will



Plan of Barge for Atlantic Power Barge Co.

over all, 23 ft. 10 in.; depth molded, 12 ft. This vessel will be a single deck, wooden steamer with machinery in the stern, built for inland service and intended solely as a freight carrier. She will have capacity for 800 tons of cargo, speed about 7 miles an hour, and will be propelled by two Globe engines, built by the Pennsylvania Iron Works Co. of Philadelphia.

have three water-tight bulkheads, forward and aft peak tanks being used for water ballast. There will be two winches capable of handling a large amount of cargo, and a windlass forward. All this machinery, as well as other auxiliaries will be driven from one or the other of the main engines by means of continuous shafting running partially on deck and partially under deck.



Cross Section of Barge for Atlantic Power Barge Co.

The vessel is built throughout of Georgia pine, with the exception of the keel and frames, which will be of white oak. The frames are spaced 15 in. center to center, thus insuring great strength. Crew and officers will be accommodated in a deck house aft over the machinery space. There will be a pilot house

This will enable the barge to load and unload her own cargoes and insure maximum speed of handling with minimum delays.

In the machinery outfit will be two 85-H. P. Globe engines, placed aft. In addition there will be an air pump for storing compressed air, bilge pump, dynamo for sparking and for elec-

tric light, and large wrecking pump, as well as such other auxiliaries as will be necessary for operating the machinery. The oil will be carried in tanks and the arrangements will be such that only one tank will be partially empty, the others being either completely empty or filled. By this means there will be very little danger of gases forming that would have a tendency to do damage. The rolling of the boat also will have a minimum effect. Owing to the automatic operation of a vessel of this sort it is possible to run her with five men, which is an extremely small complement for a boat carrying 800 tons. The barge was designed by Messrs. Sinn & Page, Baltimore, Md.

RUMORS OF A NEW COAST SHIP YARD.

Rumors which are denied by some of those interested and confirmed by others are in circulation to the effect that a large corporation is to be formed for the purpose of establishing at Camden, on Penobscot bay, a ship building and repairing plant that shall rank among the first in New England. Among those named as having an interest in the project are Thomas W. Lawson of Boston, Capt. John G. Crowley of Taunton, Mass., C. W. Henry and J. C. Strawbridge of Philadelphia, H. M. Bean, the Camden wooden ship builder, and H. L. Shepherd, a wealthy ship owner and manufacturer of Rockland, Me. It is said that a company is to be formed with at least \$1,000,000 capital, which will purchase and merge in one plant the Bean ship yards, where seventy fine wooden vessels have been built, including the first six-masted schooner ever put afloat; the Camden Yacht Building & Railway Co., recently formed; the Camden Anchor & Rockland Machine Co., the ship fitting factory of Knowlton Bros.; and other establishments, for the purpose of engaging in the building and repairing on an extensive scale of all classes of vessels, sail and steam. The Camden Yacht Building & Railway Co., organized last year, has purchased or bonded nearly the entire shore front on Camden harbor and expect to begin operations in the building and repairing of large and small yachts, steel and wood, sail and steam, before the close of 1903.

STEEL CORPORATION STATEMENT.

An analysis of the quarterly statement of the United States Steel Corporation makes very interesting reading. The capitalization of the Steel Corporation is greater than the national debts of all great powers with the following exceptions:

France, \$5,800,692,000.	Russia, \$3,167,320,000
German States, \$2,015,958,000.	Spain, \$1,727,995,000.
Italy, \$2,583,984,000	United Kingdom, \$3,060,926,000.

The net earnings of the Steel Corporation in 1902 were \$132,662,617. The countries having a larger annual revenue than this are:

Austria, \$215,237,000.	Russia, \$891,772,000
Hungary, 209,001,000	Spain, \$170,998,000.
France, \$691,349,000	United Kingdom \$583,201,000.
British India, \$328,956,000.	United States, \$684,083,000.
Italy, \$317,349,000.	

The national debt of the United States is approximately \$353,000,000 less than that of the United States Steel Corporation. After paying interest on bonds, dividends on both preferred and common stock and setting aside \$10,000,000 for depreciation there remains a surplus of \$33,841,565. The statement for the year shows about \$50,000,000 cash on hand and an appreciation of \$33,000,000 in the value of net current assets bringing the total up to \$173,000,000. The total current assets at the close of the year were \$222,367,839.

ANOTHER SHIP YARD TALKED OF.

Brooklyn is promised, in a rather vague way, however, a big new dry dock and ship building plant if the city will authorize the closing of Fifty-seventh street in that borough at the water front. Application has been made for the closing of the street by Arnold & Kenyon, owners of the shore front property there. T. Ellett Hodgskin, counsel for Arnold & Kenyon, says:

"There is now being formed a very large corporation to engage in the ship building industry which wants a place on the New York water front. If we can have Fifty-seventh street closed we can bring this concern to Brooklyn. The company intends to build the biggest dry dock in the country and to establish a very large ship building plant. It will employ at least 5,000 or 6,000 men and it is something Brooklyn cannot afford to lose. The company wants 800 ft. of water front, and to get it it will be necessary to close Fifty-seventh street. I am not at liberty to say who composes the ship building combination, but it is already an accomplished fact, and if it doesn't establish the plant in Brooklyn it will go somewhere else."

The Newport News Ship Building & Dry Dock Co., Newport News, Va., has given a mortgage to the Union Trust Co. of New York to secure an issue of \$5,000,000 in bonds authorized recently by the company. The general assembly of Virginia gave the company the right to issue the bonds two years ago and their purpose is to liquidate an existing indebtedness.

TURBINE STEAM YACHT EMERALD.

Mr. George J. Gould has chartered the new turbine steam yacht Emerald, which was built recently by Alexander Stephen & Sons at Glasgow for Sir Christopher Furness. The yacht was launched on Oct. 21 last. The Emerald is the second turbine yacht to be constructed, the Tarantula being the first. The Emerald is described as follows in the London Field:

"The new yacht, which has been built to designs by Mr. F. J. Stephen, is a vessel of very handsome appearance, no extent of accommodation having been sacrificed to obtain speed. The intention of the designer is to obtain a speed of 16 knots with an entire absence of vibration and an exceptionally low coal consumption. Dimensions: Length over all, 236 ft.; breadth, 28 ft. 8 in.; moulded depth, 18 ft. 6 in. She has been constructed under Lloyd's special survey to class 100 A1, and has a fine cut-water stem, with a beautifully carved figure head; a long stern and a range of teak-panelled deck houses extending amidships for about 118 ft. A promenade deck from side to side of the vessel is carried the whole length of the deckhouses, and on it will be placed the boats—one of which is a high-speed launch—and a large teak deck house for deck lounges and navigating room.

"The erections on the upper deck include staircases, deck lounge, cloak room, dining saloon, smoking room, drawing room, drying room, pantry, and gully casings for boiler and turbine machinery and an open deck shelter at the extreme after end. A half topgallant mast about 31 ft. in height is fitted with a steam windlass and chain and anchor gear. Below in the 'tween decks, there are seven officers' rooms, sixteen berths for the crew and also bath rooms and lavatories. The bulwarks fore and aft are of steel, with a teak top rail and inside panelling of teak. Two cellular double bottoms have been fitted, one forward and one under the turbines, for purposes of draught when the vessel is cruising light, or for a supply of fresh water for the boilers. The dining room occupies the forward portion of the group of public rooms in the range of deck houses, while the drawing room and smoking room are at the after end. From the entrance to the dining room one stair communicates with the owner's suite of four state rooms, and another with the lounge and promenade deck above.

"The accommodation for guests comprises six bed rooms. The style of designs in the entrances and public rooms is a free treatment of the English and French renaissance. In the dining saloon the panellings are of time-mellowed elm, with bone inlaid figures in the panels. The drawing room is of eighteenth century work, the panelling of dado and door being of fine toned satinwood, and the walls of Tynecastle canvas. The smoking room wall panelling is of teak framing, with soft green-stained wainscot panels, the frieze being of tinted carved wood on a field of soft bluish-green. All the state rooms, passages and bath room are designed in the same character as the public rooms, the panelled walls painted an ivory tint, with the furniture in hard woods to harmonize. Electric lighting and bells are fitted throughout.

"The vessel has three sets of turbine engines, three shafts, and five manganese bronze propellers—one propeller on the center shaft and two each on the side shafts. All these have been supplied and fitted on board by the Parsons' Marine Steam Turbine Co., Ltd., Wallsend-on-Tyne. The hull has been specially strengthened to prevent any vibration in the structure, owing to the great speed at which the shafts will revolve. In the engine room, beside the three turbines, with their condensers and the duplicate electric lighting machinery, there are a large number of auxiliary engines of all kinds. The main boiler, which is of very large diameter, is fitted with Howden's forced draft. The yacht is being fitted out in the most complete manner, and when rigged with her two long masts and thin spars she will have a fine appearance. The ceremony of naming the Emerald was performed by Miss Furness."

LITTLE DOING IN WOODEN VESSELS.

Hall Bros., Port Blakeley, Wash., writing to the Review say that the building of wooden coasting vessels on the Pacific is very quiet at present.

"Our vessel the Mabel Gale, is launched," they say, "and No. 108 is ceiled up. The low freights at present prevailing on the Pacific, and the over-production of vessels on this coast during the past three or four years when freights were high, have reduced the wooden ship building business almost to a minimum. We have no contracts besides the two noted and slim prospects of any. Our business is confined almost entirely to wooden schooners, principally for the lumber trade. Last June we incorporated the Hall Bros. Marine Railway & Ship Building Co., which purchased a site of eighty acres at Eagle harbor, directly across the sound and about 6 miles from Seattle. We have now under construction there a Crandall marine railway of a capacity of 3,500 tons and an enlarged and improved plant for the construction of wooden vessels. We expect to spend \$200,000 on the plant which will give us greater facilities for the building of vessels and allow us to enter the field of repair work which has grown extensively on Puget Sound of late and is bound to grow rapidly in the future. The railway is expected to be ready for work in the early part of 1903."

RESULTS OF SHIP TRIALS.

Babcock & Wilcox Boilers Score Points of Distinction in New British Naval Vessels—Remarkable Showing in Economy and Endurance.

In a series of articles on the subject of "War Ship Building in 1902" Engineering of London deals with the results of official steam trials of sixteen new ships of the British navy made during the year. The summary of these trials in tabular form is reprinted on this page. It will be noted that in this one year there are twelve new battleships, and it may be added that the number of new battleships was the same in 1901; but this is not surprising in view of the fact that England is spending from \$50,000,000 to \$60,000,000 a year on new vessels. All the vessels are fitted with water-tube boilers (all but two Belleville) and the great variance in coal consumption is a remarkable feature of the table. On this score the English publication makes excuse for present conditions in the following paragraph:

"It is obvious from such wide variations that the personal element is largely operative; indeed, during our own observation on such trials we have seen the influence of inexperienced men, not only on the fire grates, but also on the maintenance of steam pressure and the volume of smoke. In recent trials there has been no effort whatever made to insure even a moderate proportion of stokers with experience of water-tube boilers, so that the results embodied in the table are pretty certain to be improved on when the men on the ships have gained some knowledge of the very different conditions required for a water-tube boiler, as compared with the old tank boiler. Moreover, when the crew have, as it is expressively put, 'shaken down to their work,' there will be more restraint in stoking, and a greater possibility of the fires being kept in an incandescent state."

In the review of the results of these trials particular attention is directed to the performance of the twin-screw sloop *Odin*, fitted with Babcock & Wilcox boilers. Of all the vessels this one was the most economical. Of the trials of the three vessels of the *Odin* class Engineering says: "The three sloops *Merlin*, *Odin* and *Fantome* were all built at the Sheerness yard. Perhaps the most interesting feature in connection with their trials is the fact that they are fitted with three different types of water-tube boilers—the Belleville, the Babcock & Wilcox and the Niclausse; the Wallsend company having supplied the machinery for the *Odin*, which has the Babcock & Wilcox boilers. It will be noted from the results tabulated that this ship has given the

The Review hopes to publish, a little later on, some interesting information along this same line regarding the performance of merchant ships on the lakes, many of them of 6,000 to 8,000 tons capacity, fitted with Babcock & Wilcox boilers.

The following vessels of the British navy, now under construction, will be fitted with Babcock & Wilcox boilers:

Name of Vessel.	Type.	Horse-power.
Hermes	Second-class cruiser	10,000
Challenger	Second-class cruiser	12,500
Queen	Battleship	15,000
Cornwall	First-class cruiser	22,000
Dominion	Battleship	18,000
Commonwealth	Battleship	18,000
King Edward VII	Battleship	14,400
Argyle	First-class cruiser	16,800
Black Prince	First-class cruiser	18,800
Duke of Edinburg	First-class cruiser	18,800
Hindustan	Battleship	14,400

Building for the United States navy are the following vessels to be fitted with Babcock & Wilcox boilers:

Name of Vessel.	Type	Horse-power.
California	Armored cruiser	23,000
South Dakota	Armored cruiser	23,000
West Virginia	Armored cruiser	23,000
Maryland	Armored cruiser	23,000
St. Louis	Protected cruiser	21,000
Milwaukee	Protected cruiser	21,000
Charleston	Protected cruiser	21,000
Nebraska	Battleship	19,000
Rhode Island	Battleship	19,000
New Jersey	Battleship	19,000
Connecticut	Battleship	19,000

ADMINISTRATIVE ELEMENT IN BUSINESS

A representative of the Associated Press saw Lord Beresford in London, a few days ago, just before he started for this country.

"I hope to pick up in America," Lord Beresford said, "some information regarding the administrative element in business. That's where your countrymen excel. We do not know how to

Results of Official Steam Trials of Sixteen New Ships of the British Navy Made During 1902.

NAME OF SHIP.	Type.	Builders of Ship.	Makers of Machinery.	Length of ship in feet.	Displacement.	Type of boiler.	Heating surface.	Grate area.	30 hours' coal consumption trial.			30 hours' coal consumption trial at higher power.			Full power trial.		
									Indicated horse power.	Speed, (log.)	Coal per hour per indicated horse power.	Indicated horse-power.	Speed.	Coal per hour per indicated horse-power.	Indicated horse-power.	Speed.	Coal per hour per indicated horse-power.
London	Battleship	Portsmouth yard	Earle's Co.	400	15,000	Belleville	37,078	1183	3247	11.5	1.8	11,753	16.4 (log)	1.8	15,299	18.0 (log)	1.97
Venerable	Battleship	Chatham yard	Maudslay, Son	400	15,000	Belleville	37,074	1202	3082	11.45	2.015	11,364	16.8 (log)	1.95	15,367	18.3 (log)	2.14
Duncan	Battleship	Thames Co.	Thames Co.	405	14,000	Belleville	43,260	1380	3755	11.9	2.05	13,717	18.1 (log)	1.90	18,222	18.9 (log)	1.95
Russell	Battleship	Palmer's Co.	Palmer's Co.	405	14,000	Belleville	43,260	1393	3767	12.1	2.4	13,685	17.95 (log)	2.14	18,199	19.4 (log)	2.10
Montague	Battleship	Devonport yard	Laird Bros.	405	14,000	Belleville	43,405	1400	3676*	12.0	2.21	13,652*	17.80 (log)	1.78			
Exmouth	Battleship	Laird Bros.	Laird Bros.	405	14,000	Belleville	43,260	1393	3667	12.4	2.18	13,774	17.7 (log)	1.95	18,285	18.8 (log)	2.117
Good Hope	Cruiser	Fairfield Co.	Fairfield Co.	500	14,100	Belleville	71,970	2310	6074	14.5	1.86	22,761	22.09 m. m.	1.83	31,119	23.05 m. m.	1.91
King Alfred	Cruiser	Vickers Sons	Vickers Sons.	500	14,100	Belleville	72,003	2313	6419	15.6	1.75	22,616	21.7 (log)	1.82	30,950	23.65 (log)	1.81
Drake	Cruiser	Pembroke yard	Hum. Ten. & Co	500	14,100	Belleville	71,970	2310	6301	15.428	1.72	23,004	22.09 (log)	1.79	30,864	23.05 (log)	1.82
Leviathan	Cruiser	J. Brown & Co.	J. Brown & Co.	500	14,100	Belleville	72,003	2310	6389	15.2	1.75	22,927	21.96 m. m.	1.74	31,208	23.23 m. m.	1.94
Spartiate	Cruiser	Pembroke yard	Maudslay, Son	435	11,000	Belleville	47,300	1408	3843	12.3	1.83	14,100	19.8 (log)	1.66	18,649	21.0 (log)	1.65
Bedford	Cruiser	Fairfield Co.	Fairfield Co.	440	9,800	Belleville	50,344	1610	4522	14.9	1.91	16,005	21.27 (log)	1.97	22,457	22.7 (log)	2.12
Kent	Cruiser	Portsmouth yard	Hath., Les & Co	440	9,800	Belleville	50,300	1610	4632*	14.7	1.81	16,209*	20.45 m. m.	1.8*	22,249*	21.7 (log)	1.89
Merlin	Tw.-sc. slp.	Sheerness yard	Sheerness yard	185	1,070	Belleville	4,020	136	331	8.8	1.81	1,034	13.5 (log)	1.69	1,460*	13.43 m. m.	1.64
Odin	Tw.-sc. slp.	Sheerness yard	Wallsend Co	185	1,070	Bab. & Wil.	4,000	136	308	9.4	1.52	1,025	12.0 (log)	1.50	1,433	13.64 m. m.	1.53
Fantome	Tw.-sc. slp.	Sheerness yard	Keyham yard	185	1,070	Niclausse	3,960	135	338	9.3	1.72	1,018	12.5 (log)	1.55	1,448	13.63 m. m.	1.86

*Preliminary Report.

M. M. means measured miles.

most economical results, so far as coal consumption is concerned, of all the ships on the list, the variation for all three trials being from 1.50 lbs. to 1.53 lbs., which must be pronounced a very satisfactory result, being considerably better than the two other ships of the class. In the matter of speed, too, this ship seems to have done better at low power and at full power, 9.4 knots being realized for 308 I. H. P. and 13.64 knots for 1,433 I. H. P."

Naturally the manufacturers of the Babcock & Wilcox boilers are very much pleased with this outcome of a year's trials in the British navy. This result, they say, is additionally notable for the fact that the sloop of war *Espiegle*, fitted with Babcock & Wilcox boilers, closely followed in the path of the U. S. S. *Marietta*, which ship required no repairs to her boilers after her memorable trip around the Horn from San Francisco in company with the *Oregon*. The *Espiegle* arrived at Hong Kong from Portsmouth the early part of the fall of 1902, and was ready to go on her station duties at once as there were no repairs of any kind to be made to her boilers.

"It is a common occurrence," says one of the officials of the Babcock & Wilcox company, "for merchant ships on the Pacific coast fitted with Babcock & Wilcox boilers to be under steam continuously for forty days and start on another trip of equal duration after three days in port."

administer here. Our workmen are as good as yours, but our administrations are feeble. Our companies want lords and commoners as directors, who know nothing about business. Yours demand straight business men who not only know but put their money into the concerns of which they are directors. If I can teach the people here to adopt American business methods we can then have greater inter-communication of capital and interests between the two countries. I frankly confess that a business alliance would be more to England's than America's advantage. America can look after herself. She can fight the world either from an economic or any other viewpoint. They have not begun to realize here yet that the long period during which Great Britain has held the monopoly of trade is over. They do not know the value of a scrap heap, of the minimum cost of production or of the volume of trade. The coming century will be one of business. By trying to achieve a community of business interests and methods between America and England I believe I shall be doing much toward its being a century of peace. You put your brightest men into business. We put them into politics, the navy and the army. That has got to be changed, not for the sake of the money it makes for the individual, but for the general good of the country. When I return I hope to have a lot more information in my pocket which will further these ends in parliament and elsewhere."



OFFICERS M. E. B. A. LODGES FOR 1903.

Milwaukee lodge, No. 9—President, Wm. G. Tell; first vice-president, Joseph Mason; second vice-president, Arthur Barnes; treasurer, Edward Dixon; financial secretary, Geo. C. Rish; corresponding secretary, Wm. Bridges; recording secretary, John Lowgy; chaplain, Wm. Hunter; inner door keeper, Jacob Try; outer door keeper, Chas. McCarty; trustees, Wm. Cavanagh, Wm. Tell, Edward Dixon; delegate to national convention, Charles Bendschneider; alternate, John McCaffery.

Detroit lodge, No. 87—President Wm. J. Macdonald; vice-president, Thomas Braund; financial and corresponding secretary, George B. Milne; recording secretary, Arthur Armstrong; treasurer, Wm. McKittrick; chaplain, Richard Langford; conductor, Arthur Carter; door keeper, Geo. Gilbert; trustees, Joseph Taylor, Chas. Scott; delegate to national convention, Wm. J. Macdonald.

Detroit lodge, No. 3—President, R. R. Lacey; vice-president, Geo. M. Milne; recording secretary, F. W. Robinson; corresponding secretary, Albert L. Jones; financial secretary, Frank Kenyon; treasurer, Ed. R. Blanchard; delegates to national convention, Albert L. Jones, Ed. R. Blanchard and Wm. P. Tindall; trustee, F. G. Carey.

Duluth lodge, No. 78—President, Louis Griggs; first vice-president, Jas. Mutch; second vice-president, John Adams; financial and corresponding secretary, J. P. Burg; chaplain, Wm. Murphy; conductor, Jas. Fountain; door keeper, Bruce Pringle; delegate to national convention, Jas. Bishop; alternate, Geo. Travillion.

Buffalo lodge, No. 1—President, Edw. A. Carter; first vice-president, Chas. Cray; second vice-president, John Maxwell; secretary and treasurer, W. D. Blaicher; trustees, Wm. Gilbert, Jos. Kohlbrenner, Wm. Erskine; delegates to national convention, Henry C. Jordan, Albert Simpson, W. D. Blaicher.

Port Huron lodge, No. 43—Past president, Andrew J. Wilson; president, Chas. E. Sylvester; first vice-president, Geo. F. Robin; second vice-president, Robt. J. Smith; recording secretary, Jas. Southgate; corresponding secretary, Thos. J. Coyle; financial secretary, Walter Thorn; treasurer, Edw. Egan; trustees, Arthur Amiston, Harvey DePuy, Geo. Miller; delegates to national convention, Walter Thorn, Geo. H. Bowen.

Toledo lodge, No. 37—Past president, H. E. Beard; president, Richard Curtis; corresponding secretary, H. E. Beard; financial secretary, Martin Rake; treasurer, Samuel Foster; recording secretary, J. W. Popp; trustees, J. B. Marshall, J. Bender, J. A. Popp; delegates to national convention, Richard Curtis, H. E. Beard; alternates, John Bender, Burton Ransom.

Marine City lodge, No. 53—Past president, Frank Oullette; president, Marcus Hill; vice-president, Wm. Fritz; corresponding secretary and treasurer, Harry Stone; recording secretary, A. B. Caswell, Jr.; financial secretary, John Conley; chaplain, Wm. Sicken; conductor, John Cannon; door keeper, Al. Jacobi; delegate to national convention, Jas. Ealfour; alternate, P. J. Merrill.

Oswego lodge, No. 72—President, Pardon T. Perkins; vice-president, F. G. Axtell; recording secretary, Wm. Findlay; financial secretary, Thos. O'Neil; corresponding secretary, Thos. Navagh; treasurer, S. L. Axtell. Representation of this lodge at national convention is through Buffalo lodge, No. 1.

Cheboygan lodge, No. 55—President, John W. Lowrey; vice-president, John McLaughlin; recording secretary, J. A. McDowall; corresponding secretary, J. W. Brown; financial secretary, J. W. Brown; treasurer, Patrick Eaustace; trustees, John McLaughlin, John Nighthall, J. A. McDougall; delegate to national convention, J. W. Brown.

South Haven lodge, No. 102—President, Wm. H. Tyler; vice-president, Ralph Peterson; recording and corresponding secretary, Fred. W. Linsemeyer; treasurer and financial secretary, Wm. Tyler; delegate to national convention, Geo. Gillette; alternate, Walter Poxton.

Sandusky lodge, No. 48—Past president, Christ. Howard; president, Geo. Moore; vice-president, Phil. C. Mayer; treasurer, Wm. F. Mayer; financial secretary, Wm. Quick; recording secretary, Carl Becker; corresponding secretary, Carl V. Hart; conductor, Henry Jesson; chaplain, Adolph Stein; door keeper, Nelson Lackhart; delegate to national convention, John Hegeimer.

Grand Haven lodge, No. 76—President, Jas. Cantwell; vice-president, Samuel Kimball; recording secretary Eugene Scott; corresponding secretary, Orson Vanderhoef; financial secretary, Ralph Van Toll; treasurer, Orson Vanderhoef; chaplain, Jos. Kirkland; conductor, Emil Fritz; door keeper, John Van Hall.

Chicago lodge, No. 4—Past president, E. Morris; president, Thos. Kehoe; vice-president, Frank Riley; recording secretary, J. J. O'Connor; corresponding secretary, Jas. A. Macauley; financial secretary, D. W. Wise; treasurer, Geo. Furness; delegates to convention, Roy L. Peck, W. L. Webster; alternate, G. A. Grubb.

Ashtabula Harbor lodge, No. 91—Past president, Patrick Roache; president, Frank C. Stoeber; vice-president, Alex. McLaren; chaplain, Andrew G. Laig; recording and corresponding secretary, R. A. Davidson; financial secretary and treasurer, E. H. Learned; conductor, John Slocum; door keeper, J. A. Bennett.

Manitowoc lodge No. 77—Past president, G. P. Roth; president, Chas. Monroe; vice-president, Joseph P. Breuer; second vice-president, Wm. Makay; financial secretary, J. P. Jorsch; recording secretary, Edward Dusold; corresponding secretary, John P. Hall; treasurer, G. P. Roth; conductor, F. Hefferman; chaplain, L. Buretz; door keeper, T. Polock; trustees, J. P. Jorsch, G. P. Roth and Julius Bushman; representative to national convention, G. P. Roth; alternate, Chas. Monroe.

Bay City lodge, No. 27—Past president, M. McClean; president, C. E. Cuthbert; vice-president, F. Gartung; recording secretary, R. B. Fegert; corresponding secretary, L. C. Schwall; financial secretary, J. A. Braman; treasurer, J. Nolds; chaplain, E. Cayveow; conductor, P. Smith; outer door keeper, M. Walsh; inner door keeper, J. Wortz; delegate to national convention, L. C. Schwald.

Saginaw lodge, No. 92—Past president, Amandus G. Moll; president, Joseph D. Budd; vice-president, Miles W. Gaffney; corresponding secretary, Harry E. McArthur; recording secretary, George A. Thrasher; financial secretary, Walter A. Henry; treasurer, John Henry; chaplain, Richard Whalen; conductor, Fred Pflueger; door keeper, Alvin W. Smith; trustees, John Henry, Miles W. Gaffney, Amandus G. Moll; delegate to national convention, John Henry.

OFFICERS OF SHIP MASTERS FOR 1903.

Cleveland lodge—President, Capt. C. H. Woodford; first vice-president, Henry Stone; second vice-president, Henry Hinkle; treasurer, Thomas Jones; secretary, C. L. Allen; delegate to grand lodge meeting, C. H. Woodford; alternate, Henry Stone.

Detroit lodge—Wm. J. Crosby, president; William McLean, first vice-president; M. G. McIntosh, second vice-president; T. Lemay, treasurer; Enos J. Burke, secretary; William McAlpine, marshal; James Skifferton, chaplain; Daniel Kelley, warden; A. H. Shaffer, sentinel; H. H. Parsons, delegate to grand lodge.

Buffalo lodge—President, Walter Robinson; first vice-president, C. A. Potter; second vice-president, Geo. C. Stevenson; treasurer, John B. Hall; secretary, John Perew; chaplain, Chas. McMillen; marshal, Daniel Coughlin; warden, Andrew Kelley; sentinel, P. O'Neill; delegate to grand lodge, Walter Robinson; alternate, John Perew.

Chicago lodge—President, W. D. Hamilton; vice-president, Anthony Gallagher; second vice-president, Joseph E. Yax; treasurer, Wm. W. Shaw; secretary, F. B. Higgie; marshal, J. W. Isbister; chaplain, E. G. Kohnert; warden, C. K. Moore; sentinel, Peter McCulloch; delegate to grand lodge, W. B. Hamilton; alternate, A. Gallagher.

Marine City—President, John Jenkins; first vice-president, Hector Brown; second vice-president, F. W. Cottrell; treasurer, James Taylor; secretary, F. C. Folsom; delegate to grand lodge, J. M. Shackett; alternate, John Jenkins.

Milwaukee lodge—President, Henry Leisk; first vice-president, O. J. Solean; second vice-president, P. A. Anderson; treasurer, John McCoy; secretary, John McSweeney; delegate to grand lodge, Henry Leisk; alternate, D. C. Sullivan.

Toledo lodge—President, F. D. Lamb; vice-president, H. N. Jex; second vice-president, D. R. Lynn; secretary and treasurer, E. G. Ashley; chaplain, E. E. Doville; marshal, J. B. Warner; warden, John Cunningham; sentinel, Geo. H. Burnham; delegate to grand lodge, Geo. H. Burnham; alternate, George V. Sage.

In the death of Alexander Anderson, who died at Marine City last week, the lakes lost one of the earliest ship builders. A number of the wooden craft which ply the lakes were built by him. His latest product was a sand-sucker for Toledo parties. His death was very sudden. He had been ill only two weeks and was carried off by a sudden attack upon the heart. He was about fifty-five years old.

AROUND THE GREAT LAKES.

A new chart of Lorain harbor in colors has just been published by the United States Lake Survey. It may be had from the Review.

The Cleveland-Cliffs Iron Co. has purchased about sixty-eight acres of land fronting on the Maumee and Duck creek, Toledo, for reserve use. The company has no industrial plans connected with it.

Mr. Russel Rumsey, an old resident of Vermillion and father of A. L. Rumsey, shipping master for the Lake Carriers' Association, died at the home of his son near Vermillion on Friday last. He was eighty years of age.

W. W. Parshall, who has been contracting agent for the Barry Transportation Co. at Menominee for the past season, has accepted a position as general freight and passenger agent of the Hart Steamer Line of Green Bay.

The Gray Transportation Co. has, it is understood, purchased the steamer Arizona and the schooners Plymouth and Scotia. The vessels have been the property of the company at Bay City of which W. D. Young has been the managing owner.

The Cleveland-Cliffs Iron Co. has purchased the Crosby iron mine on the Mesabi range. It lies near Nashwank and is about 18 miles west of Hibbing. The price paid was \$170,000. Little has been done with the mine since it was discovered ten years ago.

Annual meetings of the several corporations owning big steel vessels operated in the office of Mitchell & Co. were held at Mentor, near Cleveland, on Monday last. Capt. John Mitchell is general manager of all the companies. Practically no change was made in the officials.

The Detroit & Cleveland Line has leased of Edward W. Bissell his wharfs and warehouses at the foot of First street for six years. This gives the D. & C. a total frontage on the Detroit river of 1,650 ft. The Bissell property has a frontage of 400 ft. on the river and is 135 ft. deep.

The Globe Steamship Co., Steel Steamship Co., Inland Star Steamship Co. and the Merida Steamship Co., which operate vessels of the Gilchrist fleet, held their annual meetings a few days ago. Mr. J. C. Gilchrist is president and general manager of all the companies and only a few changes were made in the directors.

During every period of scarcity in lake marine items lately, Chicago newspapers insist upon combining the passenger steamboat lines of Lake Michigan. Two sets of promoters have undertaken the task within the past few months but capital is a little shy of combinations these days, except in cases of very large earnings.

An elaborate affair in Detroit, the one social gathering among ship masters, is their annual ball, always held while the Lake Carriers are holding their annual meeting at the Hotel Cadillac. Special efforts are being put forth to make the ball a grand success this year. It is to be held at the Masonic Temple on Wednesday evening, Jan. 21.

The Royal Canadian Humane Association has unanimously awarded medals to Thomas McGaw, Sr., Thomas McGaw, Jr., John McGaw, Walter McGaw, Robert Sanders, Robert Greenless and Daniel Matheson for conspicuous heroism in saving the crew of the schooner Ann Maria, which was stranded near Kincardine piers, Lake Huron, during a terrific gale on Oct. 7, 1902.

Capt. A. D. Campbell, who was in charge of the Algoma Central tug Philadelphia last summer, has been awarded the life-saver's medal by the Royal Humane Society. He rescued a boy from drowning at Sault Ste. Marie last summer. The manner in which this society, working throughout Canada, promptly recognizes all such acts of bravery is highly commendable.

The sale of the Midland Coal Co. and National Dock & Fuel Co., of which latter concern Mr. John A. Donaldson of Cleveland, was general manager, to the Pittsburg Coal Co. has been closed. This matter was referred to in these columns a week ago. Mr. Donaldson and Mr. A. W. Horton, lake manager for the big coal corporation, are now engaged in fixing up the details of transfer.

Cleveland's winter fleet is made up of 116 vessels. The carrying capacity ranges from 400 tons to 7,000 tons and combined they have a capacity of 281,300 tons of coal. The vessels will, of course, not all load coal but if they did they would take pretty close to 300,000 tons of coal on the lakes on the first trip in the spring. Forty-three of the vessels are in what is known as the old river bed and the others strung along the main river above Main street bridge.

Considerable work in refitting and redecorating the D. & C. Line steamers, Detroit, Cleveland, Mackinac and Alpena, will be done during the winter. The contract for decorating the Cleveland and Detroit has been let to the William Wright Co. of Detroit, the painting to Whitnev & Smith of Detroit, the electrical work to the Hiram Marks Electric Co., the contract for carpets to Newcomb, Endicott & Co., Edson, Moore & Co., and Burnham, Stoepel & Co. of Detroit, while, as usual, the hull and engine repairs will be made by the Detroit Ship Building Co.

Some one has figured that in tons of freight the relative importance of the principal ports of the lakes in the season of 1902 was as follows: Duluth, 10,285,815 tons; Cleveland, 9,873,848 tons; Buffalo, 9,727,304 tons; Milwaukee, 9,097,468 tons; Chicago, 8,772,905 tons. These figures may be approximately correct but it is well understood that there is no possibility of getting exact figures as to the commerce of any port on the lakes under existing methods in the custom houses, which have to do with the arrival and departure of vessels. This is not said with any thought of questioning the relative importance of any of the several ports above referred to.

A dispatch from Ogdensburg says that Canadian vessel men interested in lake and river trade have joined the Ogdensburg marine men in petitioning the Dominion government to provide better facilities for navigating the treacherous channel near the Duck islands at the mouth of Lake Ontario. They ask for a lighthouse on the Main Duck and a fog signal on False Duck. Several wrecks occurred there last season. Owing to a strong local magnetic attraction in the vicinity steering by compass is exceedingly dangerous and a red light is asked for to distinguish it from other lights. Magnetic attraction is said to be stronger there than at any point on the great lakes.

It is reported from Ogdensburg that the Geo. Hall Coal Co. of that place has purchased from the Columbia Iron Works of Port Huron, one of the two small steel steamers which they have under way at their new St. Clair river yard. The consideration is said to be \$150,000. That figure is probably too high, unless some changes are to be made in original plans for the vessel. Four steel steamers are under way at the Columbia works. Two of them are of about 6,000 tons capacity each and are for J. C. Gilchrist of Cleveland. The other two, one building on yard account and the other for T. J. Prindiville and associates of Chicago, are of 200 and 225 ft. keel length, respectively. Probably the yard account steamer is the one purchased by the Hall company.

The Chamber of Commerce of Erie has revived the subject of raising Perry's old flagship Niagara, which lies at the bottom of Presque Isle harbor. A petition is to be sent to congress to appropriate \$10,000 for the undertaking. If Erie was really desirous of raising and restoring this old flagship it would do it without federal assistance. In fact, as a matter of local pride, it should do it. The expense would be inconsiderable—probably far less than \$10,000—and the leading vessel in a really marvelous naval engagement would be worth seeing. Probably it would even be worth going to see and Erie might become a mecca for the historically curious. It isn't likely that many cities of the size of Erie with such a valuable relic obtainable would petition the government to do what they could very well do themselves.

OFFICERS AMONG MASTERS AND PILOTS

Officers elected by the Cleveland harbor of the American Association of Masters and Pilots of Steam Vessels Monday evening are: Captain, A. H. McLachlan; first pilot, Richard Neville, Jr.; second pilot, James F. Goodwin; purser, Richard Neville, Sr.; captain's clerk, Charles A. Himman; delegates to Washington for the grand harbor, Jan. 21, A. H. McLachlan and Daniel Henderson.

Detroit harbor—Wilson McGregor, captain; Philip R. Frost, first pilot; Samuel S. Bunnell, second pilot; David Wilson, purser; E. S. Pickell, captain's clerk; delegates to grand lodge session at Washington, H. J. Heegan and Wilson McGregor; alternate, Philip R. Frost.

Milwaukee harbor—Captain, Capt. D. C. Sullivan; first pilot, F. W. Van Patten; second pilot, Warren C. Jones; chaplain, Alex. Eliason; purser, N. J. McIsaac; captain's clerk, F. L. Tonkin, who was also elected delegate to the grand harbor meeting at Washington Jan. 21.

HALF THE ORE FROM MESABI.

Although opened up only ten years ago, the Mesabi range of Minnesota is now furnishing to the blast furnaces and steel works of the country practically half the ore that comes from the Lake Superior region. Exact figures dealing with shipments from the different ranges in 1902 are not yet at hand, but the reports are complete enough to show that of the total output of about 27,500,000 gross tons from the Lake Superior mines full 48 per cent. was from mines of the Mesabi range. The following table shows the percentage of the whole furnished by the Mesabi range since shipments from that range were begun in 1893:

Year.	Mesabi.	Total.	Pct.
1893	613,620	6,065,716	10
1894	1,793,052	7,748,312	23
1895	2,781,587	10,429,037	26
1896	2,882,079	9,934,828	29
1897	4,275,809	12,464,574	34
1898	4,613,766	14,024,673	32
1899	6,626,384	18,251,804	36
1900	7,809,535	19,059,393	41
1901	9,004,890	20,589,237	44
1902 (estimated)	13,290,000	27,400,000	48

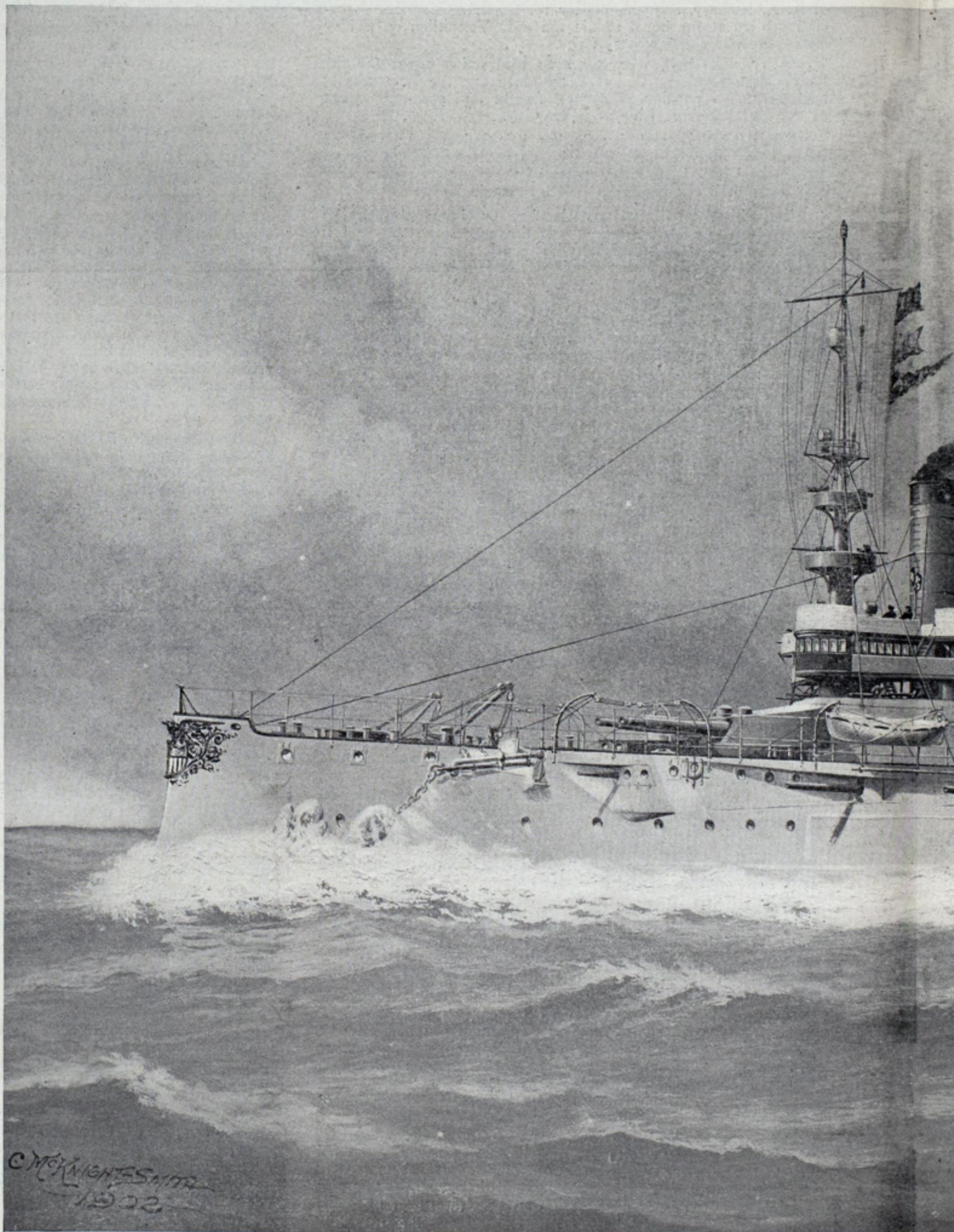
ARMORED CRUISERS TENNESSEE AND WASHINGTON.

The new armored cruisers Tennessee and Washington are to be built by Cramps of Philadelphia. Bids were opened last week for the construction of these vessels and the bid of Cramps was held to be the lowest and best. The other bidders were the Newport News Co., the Bath Iron Works, the Fore River Ship & Engine Co., the Union Iron Works and Moran Bros. Co. Cramps submitted three bids—one upon the department's designs, one the department's designs modified by the ship building company and the third to equip the cruisers with turbines. The third proposition was not considered at all, but upon the second proposition the naval board of construction reported as follows:

"The lowest bid is that of the William Cramp & Sons Ship & Engine Building Co. of Philadelphia in which they offer to build two vessels at \$4,000,000 each and complete one in thirty-six months and the other in thirty-nine months. This bid is under class II, namely, it modifies the government plans and specifications to the extent of substituting the arrangement of the machinery of the armored cruisers Colorado and Pennsylvania, of the same power, but of different arrangement from that specified for the Tennessee and Washington. It substitutes the Niclausse boiler, arranged in six fire rooms, for the Babcock & Wilcox boiler, arranged in eight fire rooms, as shown in the government plans. The changes in engines and boilers involved changes in location of bulkheads in hold and of spaces on the berth deck which are objectionable. It also offers for the electric plant the Carbo alternating generator and system but agrees to substitute therefor the reciprocating, direct-acting generators and system specified by the government for the additional sum of \$35,000. While there are certain features of the plans above referred to which are not considered as satisfactory in all respects as those prescribed in the department's plans, they are matters which permit of satisfactory adjustment, and under these circumstances, the bid of Messrs. Cramp & Sons, above quoted, offers the construction of the vessels at the lowest cost and in the shortest time. The board, therefore, recommends the acceptance of this bid for both vessels with the electric current generating plant and system as specified by the government plans and specifications, at \$4,035,000 each. Acting under the advice of the engineer in chief the board is of the opinion that boilers of Babcock & Wilcox type should be required."

The Cramp company thereupon agreed to substitute Babcock & Wilcox boilers for Niclausse boilers. The cruisers are to have a speed of 22 knots, the same as the Maryland and St. Louis class, and 1 knot in excess of the designed speed of the New York class. Although they will be slower than many foreign modern cruisers they will excel in battery power and protection any armored cruiser built, building or designed. The general features and dimensions of these vessels are as follows:

Length on load water line, 502 ft.; breadth, extreme at load water line, 72 ft. 10½ in.; displacement on trial not more than 14,500 tons; mean draught to bottom of keel on trial displacement, 25 ft.; maximum displacement, full load condition, with coal bunkers full, full supply of stores, ammunition on board and water in boilers, 15,950 tons; mean draught at maximum load, 27 ft.; coal carried on trial, 900 tons; total coal bunker capacity, 2,000 tons; steaming radius at 10 knots per hour, about 6,500 knots; steaming radius at full speed, about 3,100 knots.



THE ARMORED CRUISERS TENNESSEE AND WASHINGTON

The hull is protected by a 5-in. belt of armor extending from 5 ft. below the normal water line to the upper deck in wake of 6-in. guns; this armor extending completely to the bow and stern near the water line to form a water line belt, being reduced in thickness at the ends to 3 in. Extending from the gun deck to the protective deck are bulkheads of 5-in. armor which form the forward and after limits of the belt armor. Between the gun and berth decks are similar bulkheads located in wake of the 10-in. barbets which are fitted on the gun deck

and form the forward and after limits of the side armor between the main and gun decks. Above the gun deck in wake of the 3-in. battery, 2-in. nickel steel is fitted. The 6-in. guns on the gun deck are isolated by splinter bulkheads of $1\frac{1}{2}$ in. nickel steel, extending continuously across the ship, and 2-in. nickel steel extending fore and aft.

The 10-in. turrets are protected by 9 in. of armor on the sloping face, 7 in. of armor on the sides, 5 in. in the rear and with top plates of $2\frac{1}{2}$ in. nickel steel. The barbette armor is

consist of four 10-in. breech loading rifles and sixteen 6-in. breech loading rifles. The secondary battery will have twenty-three 3-in. rapid-fire guns, twelve 3-pounder semi-automatic guns, two 1-pounder automatic guns, two 1-pounder rapid-fire guns, two 3-in. field pieces, two machine guns of .30 caliber and six automatic guns of .30 caliber.

The 10-in. guns will be mounted in two elliptical, balanced turrets protected by armor as described, and they will be under complete electrical control as will also be their hoists and their

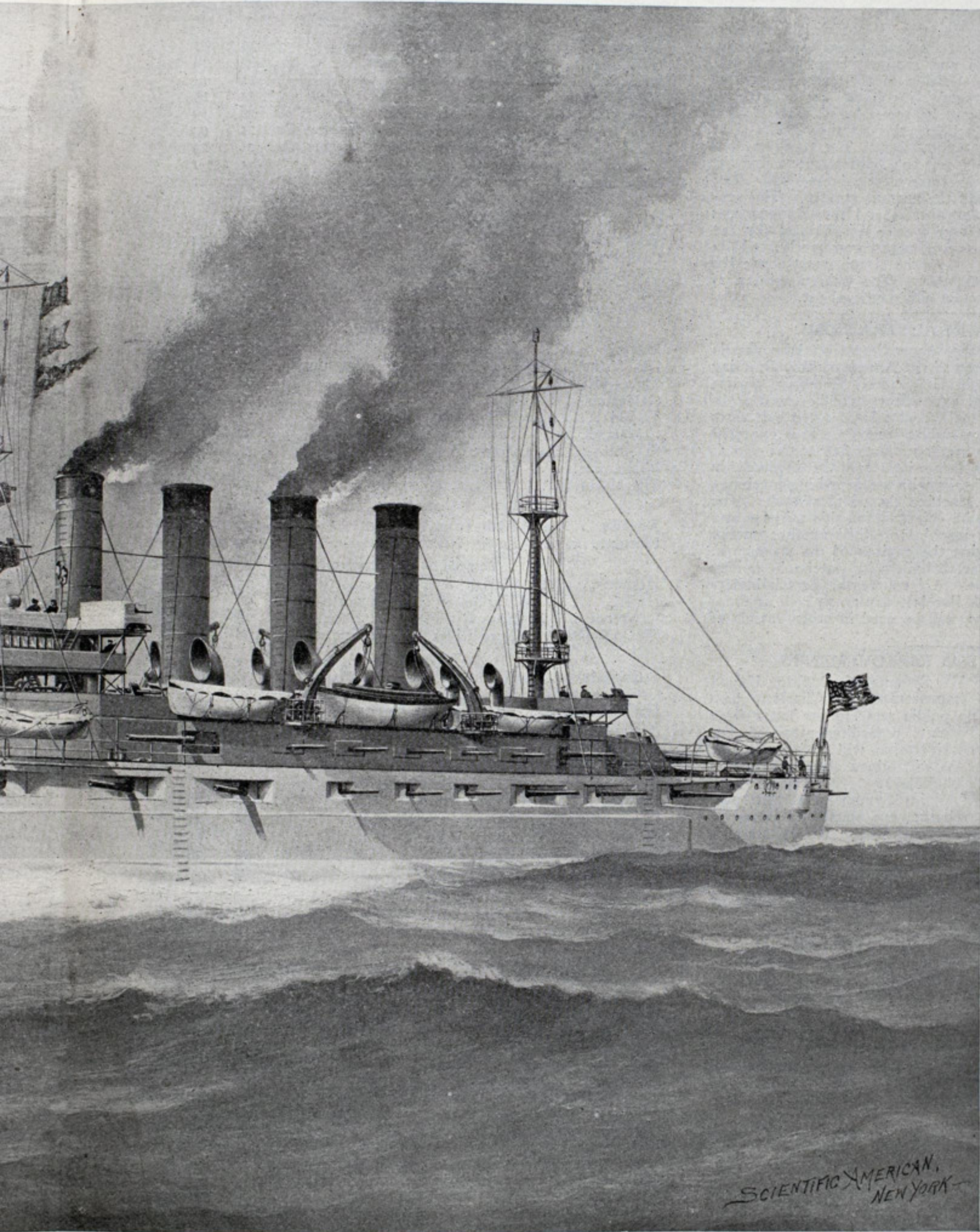
loading and training mechanism. The 6-in. guns will be mounted four in independent armored casements on the main deck, the remainder in broadside on the gun deck, all on pedestal mounts, the back and side plates of the casements on main deck being of 2-in. nickel steel. At each end of the vessel four of the 6-in. guns can be trained directly ahead or directly astern respectively, so that it is possible to obtain a direct ahead fire with the main battery of two 10-in. guns and four 6-in. guns, and the same number at the stern. The 3-in. guns will be mounted as follows: Six in sponsons on the gun deck, six in broadside on the gun deck and ten in broadside on the main deck. The 3-pounders and smaller guns are mounted on the upper deck, bridges and in the tops.

The ammunition and shell rooms are so arranged that one-half the total supply of ammunition will be carried at each end of the ship. With the increase in battery special care has been required in developing these designs to secure an adequate rate of supply of ammunition from the magazines to the guns. For handling 6-in. and 3-in. ammunition the ships have been provided with a central passage extending completely from the forward to the after magazines, and four side passages at each end to extend a sufficient distance forward and aft to provide for handling the ammunition within the armor protection on the decks above. All of these passages are at the level of the upper deck platform and such quantity of both 6-in. and 3-in. ammunition is stowed at this level as would probably be required in any action. The remaining ammunition is stowed where it can readily be whipped up by hand when time is available from the lower to the upper platform.

For handling ammunition along the central passage there will be ammunition conveyors, which are nothing more than traveling platforms onto which ammunition can be loaded at one end and delivered abreast the various ammunition hoists at different

points in its travel. Provision has been made by means of power hoists to handle the 6-in., 3-in. and 3-pounder ammunition at the rate of seven pieces per minute.

The propelling engines will be of the vertical, twin-screw, four-cylinder, triple-expansion type of a combined indicated horse power of 23,000. The steam pressure will be 250 lbs. and the stroke 4 ft. The engines will be located in two separate watertight compartments. Steam will be supplied by a battery of Babcock & Wilcox boilers,



WASHINGTON AS THEY WILL APPEAR WHEN COMPLETED.

7 in. thick in front, reduced to a thickness of 4 in. at the back and below the gun deck where protected by the belt and casement armor. The protective deck which extends from bow to stern, will be $1\frac{1}{2}$ in. thick on the flat over the engine and boiler spaces, 4 in. thick on the slopes at the side, extending down to the bottom of the belt armor, 3 in. on the slope, forward and aft. A cofferdam 30 in. thick will be worked from end to end of the vessel between the protective and berth decks.

The armament will be as follows: The main battery will

[From the Scientific American.

FINAL OPINIONS IN COLLISION CASES.

The United States court of appeals at Cincinnati a few days ago entered final decrees in several admiralty cases of the lakes, among them two very old collision cases. In November, 1892, the steamer Susan E. Peck collided with the schooner Nelson in the Lime-Kiln cut, Detroit river. The Nelson was in tow of the steamer Folsom, which also had the schooner Mitchell in tow. Judge Swan of the United States district court, Detroit, held the Folsom and Nelson as well as the Peck at fault and divided the damages. The circuit court reverses this decision and holds the Peck entirely at fault.

In another case, that of the St. Clair Steamship Co., owning the steamer Kaliyuga and consort Fontana, against the steamer Appomatox, schooner Santiago and steamer Inter Ocean, the circuit court also reverses the decision of the district court at Detroit. In this maritime tragedy, involving five actors, the sufferer was the Fontana. It will be remembered that she was sunk in the St. Clair river, just below the entrance to the river from Lake Huron, and proved a total loss. The Kaliyuga and Fontana, coming down the river, met the Appomatox towing the Santiago, bound up, and also the Inter Ocean, bound up. The river is narrow at this point and the current strong. The vessels "mixed up," to use popular phrase, and the Fontana was sunk by the Santiago. The Inter Ocean was blamed for the collision and brought into the case. Judge Swan condemned the Santiago for the full damage. Now the circuit court condemns the Inter Ocean for the full damage. The written opinion of the court has not been given out in either case as yet.

HALF A MILLION IN ALTERATIONS.

It is more than probable that expenditures on lake vessels of the Steel Corporation in yards of the American Ship Building Co. during the winter will aggregate \$500,000. Extensive repairs will be made, but the principal expenditure will be involved in changing interior construction of the vessels so as to suit them to the use of grab buckets in unloading iron ore. It is expected that this change will be made in about thirty-five of the vessels during the winter. Another large item will be involved in equipping sixteen of the whalebacks with steam towing machines, to be furnished by the Chase Machine Co. of Cleveland. The turrets of the whalebacks will be enlarged for this purpose and decks strengthened under the machines. Still another special item is that involved in changing the engines of the steamer F. B. Morse and replacing her Scotch boilers by water-tube boilers of the Babcock & Wilcox type. Of course the Scotch boilers taken out of the steamer O. M. Poe last winter, as well as those being removed from the Morse, will be used in other vessels of the fleet.

CHARLOTTE HARBOR IMPROVEMENTS.

Although Major Thomas W. Symons of Buffalo, United States engineer in charge of improvements at Charlotte harbor, Lake Ontario, has made no public reply to the letter from Capt. Thomas Donnelly of Toronto, regarding proposed improvements at Charlotte, full consideration will undoubtedly be given to Capt. Donnelly's letter, as will others on the subject at the meeting in Toronto today (Thursday).

"There are strong reasons," Major Symons says, "for narrowing the entrance to Charlotte harbor and equally as strong or stronger reasons have developed against it. We will weigh them all and try to decide the matter rightly. I was not clear in my own mind about the matter and that was the reason why I asked the opinion of mariners and vessel owners and called a public meeting to consider it, even after congress had made an appropriation for it."

CLERGUE'S ENTERPRISES AT THE SAULT.

Mr Francis H. Clergue, general manager of the Lake Superior Consolidated and subsidiary companies, consulted with the representatives of the company at Montreal last week. Said he after the conference:

"Every branch of the work will be pushed forward to completion as rapidly as possible. Thirty million dollars of American capital has been sunk in the enterprises and I am satisfied that not a single dollar will be lost. The works are now in such a position that with or without me they will work themselves out."

The torpedo boat destroyer Lawrence, first of her class, built by the Fore River Ship & Engine Co., Quincy, Mass., successfully passed her final government trial in a straight-away dash across Massachusetts bay at a speed exceeding the required 26 knots per hour last week. She attained a maximum speed of 29 knots some weeks ago over a measured mile off Provincetown, which was a knot in excess of the government requirement. The trial last week was to prove her endurance at high speed during an hour's run and her ability to make a short run and a quick stop. She returned to Fore River with a broom at her masthead.

The Pike, second of the Holland submarine torpedo boats to be built on the Pacific coast, will be launched from the yard of the Union Iron Works, San Francisco, this week. The Grampus, launched some months ago, will have her trial in a few weeks.

SUMMARY OF NAVAL CONSTRUCTION.

As a rule the vessels building for the United States navy show from 1 to 2 per cent. progress in construction from month to month, with the exception of the torpedo craft, which make no perceptible progress. These lesser craft are, however, practically complete in a structural sense. The protected cruisers are forging ahead and doubtless will have their trials in a little while. Following is the latest summary:

Name.		Building at	Degree of completion. Per Cent.	
			Dec. 1.	Jan. 1.
Battleships.				
Missouri.....	Newport News Co.		79	81
Ohio.....	Union Iron Works		67	68
Virginia.....	New port News Co.		11	14
Nebraska.....	Moran Bros. Co.		12	13
Georgia.....	Bath Iron Works		16	19
New Jersey.....	Fore River Ship & Engine Co.		21	23
Rhode Island....	Fore River Ship & Engine Co.		21	23
Connecticut.....	Navy Yard, New York		1	1
Louisiana.....	Newport News Co.		0	1
Armored Cruisers.				
Pennsylvania....	Cramp and Sons		38	40
West Virginia...	Newport News Co.		41	42
California.....	Union Iron Works		15	18
Colorado.....	Cramp and Sons		41	44
Maryland.....	Newport News Co.		39	41
South Dakota...	Union Iron Works		14	18
Protected Cruisers.				
Denver.....	Neafie & Levy		85	86
Des Moines.....	Fore River Ship & Engine Co.		77	78
Chattanooga....	Lewis Nixon		68	68
Galveston.....	Wm. R. Trigg Co.		66	66
Tacoma.....	Union Iron Works		57	61
Cleveland.....	Bath Iron Works		90	91
St. Louis.....	Neafie & Levy		11	13
Milwaukee.....	Union Iron Works		6	9
Charleston.....	Newport News Co.		20	23
Monitors.				
Nevada.....	Bath Iron Works		99	99
Florida.....	Lewis Nixon		95	96
Torpedo Boat Destroyers.				
Hopkins.....	Harlan & Hollingsworth		95	95
Hull.....	Harlan & Hollingsworth		96	97
Lawrence.....	Fore River Ship & Engine Co.		99	99
McDonough....	Fore River Ship & Engine Co.		98	98
Torpedo Boats.				
Stringham.....	Harlan & Hollingsworth		98	98
Goldsborough...	Wolff & Zwicker		99	99
Blakely.....	Geo. Lawley & Son		99	99
Nicholson.....	Lewis Nixon		98	98
O'Brien.....	Lewis Nixon		98	98
Ungey.....	Columbian Iron Works		77	85
Submarine Torpedo Boats.				
Plunger.....	Lewis Nixon		99	99
Grampus.....	Union Iron Works		90	91
Pike.....	Union Iron Works		82	85
Porpoise.....	Lewis Nixon		99	99
Shark.....	Lewis Nixon		98	98
Steel Tugs.				
Steel Tug.....	Navy Yard, Boston		2	2
Steel Tug.....	Navy Yard, Mare Island		0	0

BRITISH WESTINGHOUSE COMPANY.

Directors of the British Westinghouse Electric & Manufacturing Co., Ltd., of London, Eng., have recently issued their third annual report, showing a material increase in growth of the company's business and indicating an industrial re-awakening in England. Heretofore, orders have been executed at Pittsburg, but now that the company's works at Trafford Park, Manchester, Eng., are practically completed and about 3,000 men employed, manufacturing operations have begun and all orders will hereafter be executed there. A construction department has been organized to carry out building and general construction work, thus enabling the company to undertake the complete installation of large railway, power and lighting plants. This department will be under the management of Mr. James C. Stewart of the well known engineering firm of James C. Stewart & Co., whose record bricklaying performance in connection with the Manchester works caused so much discussion. Many important contracts have been obtained by the British Westinghouse Co. during the past year, including those with the Metropolitan District Railway Co., the Metropolitan Railway Co., the Clyde Valley Electrical Power Co., the London United Tramways Co., Ltd., the Bath Tramways Co., Ltd., Exeter corporation, Newcastle corporation and the Swansea corporation.

The erection and equipment of the works at Trafford Park have absorbed the bulk of the available capital of the company, so that \$3,000,000 worth of additional shares will be issued paying 6 per cent. dividend.

SOME ADVANTAGES OF SIDE-WHEEL STEAMERS.

The fact that the latest contract of the New York, New Haven & Hartford Railroad Co. was for a side-wheel steamer for the Fall River Line has caused eastern men to do some speculating in this type of craft. For some years the history of Sound steamboats has shown that the twin-screw steamer has been supplanting the side-wheeler in service in the eastern waters. Of the steamers controlled by the New Haven road the Richard Peck, the City of Lowell and the Chester W. Chapin have all been built between 1892 and 1899 and are twin-screw steamers. The side-wheeler evidently possesses advantages in Sound traffic, otherwise the company would not return to it.

"The return to the side-wheel type of boat, and the investment of \$1,000,000 in one of them means," said a well-known Sound steamboat man, "that the twin-screw steamer will never become supreme in Sound traffic, as its larger brother of deeper draught has become on the ocean. It means that modern side-wheel boats of the palatial class will always be used on great through lines on inland waters like the Sound. The reasons are not far to seek. They were, I am told, principles that to an extent had always been held by the late George Pierce, the superintendent of the road's marine repair plant, and who planned the Priscilla and Puritan, the palatial side-wheelers which the new boat is to match. In the first place a primary reason for putting another side-wheeler on the Fall River route instead of a screw boat, is because its boats have to pass around dreaded Point Judith, R. I., nightly, than which in times of southeast and southerly gales there is really no more exposed point on the New England coast. Now, for screw boats of such shallow draught as the Peck and the Lowell (and they are by no means toys, being about 17 ft. deep) when they strike into water that is sufficiently rough, and it is frequently found in the wintry season off Point Judith, they pitch and roll worse than the modern side-wheel boat, promoting seasickness and general misery among the passengers who, on the Sound, usually patronize the boat that is remarkable for her stability, other things being equal. And, worse than the rolling is the fact that these boats sometimes get to pitching so that they thrust their screws out of water and then the screws get to racing, thereby creating still greater discomfort for the passengers, and to the steamboat men themselves, for no one knows just what a 'racing' engine may do. The screws are whirled about for a moment with great velocity in the open air and then brought almost to a standstill as they are plunged far beneath the brine once more. This operation is repeated again and again, perhaps, and there is a general feeling of relief among all concerned when the boat finally reaches smooth water.

"With the new class of side-wheelers all this trouble is done away with. They are fitted with twin engines and feathering wheels. The twin engines give them about the same advantage that the twin engines on the screw boats do, and the feathering wheels give them a greater advantage than most people realize. In fact, it is the feathering wheel, as now used, that has decided the balance in favor of the side-wheeler for such an exposed route as that around Point Judith. The modern side-wheel boat does not have the large paddle boxes and paddle wheels of twenty years ago, with buckets beating the water with thundering noise in their descent upon it and lifting tons of snowy foam in their ascent, thus wasting any amount of energy. The feathering wheel of the modern craft is of comparatively small diameter, and is built into the hull on each side of the boat so that it attracts very little attention. Its buckets, or paddles, have a motion on an axis, and are so operated by machinery that as the wheel turns the buckets descend into the water very nearly vertically, push straight astern as the wheel continues to turn and ascend from the water in a vertical position again as the wheel finishes its revolutions. The movement of the paddle is such that accordingly as the boat is being run ahead or backwards, its entire power is exercised to push the water astern or ahead. It neither pounds or lifts the water, and it makes no fuss in doing its work, and consequently the novice would not suppose it was doing much work anyway. but the reverse is found to be the case, the little feathering wheels in use on the Priscilla are capable of pushing that boat forward to such an extent that it is a question today among many as to whether she is not still 'the queen of the Sound.' And the work of the New York-Bridgeport side-wheeler, William Payne, which is known to be a 'flyer,' is of the same class.

"A boat powered with this style of wheels then has this advantage over the twin-screws: There is no 'racing' of the wheels. Besides there is no more of the great strain of the old-time paddle wheels as they pounded and lifted the water in their revolutions in a sea way; the power is applied to the water steadily at a point near to the center of the boat and there is absolutely no waste of power and the boilers and machinery being below the main deck, and the great paddle boxes and wheels being absent, there is not that top-heaviness which made the old-time steamers roll so, a rolling which was conducive to creating a wholesome horror of a night upon the Sound.

"Last, but by no means least, comes the important fact lost sight of by the marine sharps, but not by those engaged in passenger traffic, that the construction of a side-wheel boat is such as to give her a much wider main deck upon which to erect the superstructure of the boat and it is the size of this super-

structure upon a modern passenger boat that pulls in the money for the line. Properly divided into dining halls, elegant parlors, state rooms and smoking rooms, richly carved and gilded and supplied with music and feasting, this superstructure strips travel of its disagreeable features to some extent. The large twin-screw Sound boats do not begin to be the money earners from this source that the side-wheeler of the Priscilla type is today, and will continue to be in the future, for they will not accommodate nearly as many passengers.

"The new boat will be 397 ft. long, 90 ft. wide over guards, and 21 ft. deep, 3 ft. deeper than the Priscilla. The Richard Peck, to cite a boat of the twin screw type, is 303 ft. long, 48 ft. wide and 17 ft. deep. It requires no calculation at all to see that many more passengers can be accommodated in an upper works built over the hull of the new side-wheeler than over the hull of a boat as narrow as the Peck. Probably for this reason, if for no other, side-wheel boats will always be run for passengers on such lines as that from Fall River."

SHIP YARD NOTES.

E. S. Crosby of Bath, Me., is stretching the keel of a new four-masted wooden schooner for Frank T. Stinson.

Green Bros., Bridgeport, Conn., have received an order to build a five-masted wooden schooner for Capt. Lucius J. Stevens of Clinton, Conn. The schooner will be 240 ft. keel, 40 ft. beam and 22 ft. deep.

A three-masted wooden schooner, the Florrie, was launched from the New England Co.'s yard, Bath, Me., last week. Her dimensions are: Length, 218 ft. 3 in.; breadth, 35 ft. 2 in.; depth, 18 ft. 1 in. She is owned by the Baltimore & Boston Barge Co. The Florrie is of unusually strong construction.

According to advices from Seattle, expenditures aggregating \$700,000 are to be made by the Alaska Steamship Co. and the Puget Sound Navigation Co. during the present year. Four new vessels are to be constructed, the contract for one of them having already been awarded to the Heffernan Iron Works of Seattle. This steamer will be 240 ft. long and will have accommodations for 225 first-class passengers.

The side-wheel steamer built to the order of Mr. Charles M. Schwab for the conveyance of poor children to the seaside, was launched at the Crescent Ship Yard, Elizabethport, N. J., last Saturday. It was at first decided to call her Eurana, but at the last moment the name was changed to Happy Day, and thus she was christened by Miss Elizabeth Dinkey, a niece of Mr. Schwab. The steamer was towed to the works of the W. & A. Fletcher Co., Hoboken, N. J., where she will be fitted with engines after which she will be returned to the Crescent Ship Yard to be completed.

UNITED STATES SHIP BUILDING CO.'S REPORT.

The United States Ship Building Co. filed with the New York Stock Exchange recently an application to list its securities and with it a statement of its earnings for the quarter ended Nov. 30, 1902, being the first three months of its business. The showing made is very good, and, coming, as it does, in a regular business-like way, is evidence of the intention of the management to make public its earnings and operations at regular intervals. The net earnings for the quarter ended Nov. 30, including the Bethlehem Steel Co., were:

Earnings	\$1,163,022.22
Deduct:	
Reserve on estimated profits on contract work on ship building construction	\$74,138.04
Accrued interest and sinking fund payment on all United States Ship Building Co.'s bonds for quarter	391,666.67
	<hr/> 465,804.71
Surplus net earnings	\$ 697,217.51

In all large work under contract where full completion does not take place, as in ships, sometimes for a year or more, the current earnings and profits are estimated upon actual cost and ascertained profit. There is always a contingency of some possible loss by delay, change or defect, which should be provided for in giving the estimated profits. The ship building company has adopted a policy of liberal reserve in that respect. It will be further seen that the reserve only applies to the profits and earnings of the ship building company, and has no reference to the earnings of the Bethlehem Steel Co., which are actual and fixed, and not subject to estimate. The surplus net earnings of \$697,217.51 for the first quarter are equivalent to a basis of 6 per cent. on the preferred and over 7 per cent. on the common stock, after paying and providing for all interest charges of every kind, including sinking fund provisions, and including all interest charges on account of the underlying mortgage obligations of the Bethlehem Steel Co.

In a report to congress Secretary Moody says that the government dry dock at Port Royal has become worthless. He adds that when the new dry dock at Charleston is completed there will be no need of the Port Royal dock.

BRITISH SHIP BUILDING

Output of United Kingdom in 1902 was less than in 1901, and outlook for another year is not encouraging—Period of depression seems inevitable—Reducing wages in Clyde yards.

Glasgow, Jan. 3.—In a recent letter I stated that the output of new ships in the United Kingdom in 1902 would probably be 100,000 tons down. The total recorded, subject to revision as all returns are, is 1,619,040 tons, which compared with the revised total of 1,799,088 tons in 1901, shows a decrease of 180,048 tons. The falling away in the English yards has thus been greater than I anticipated. Had they been as busy as the Scotch yards have been, the 1902 output would have been a record. As it is, the totals are as under, as nearly as we can get at them at present.

	1902		1901	
	Tons	I. H. P.	Tons	I. H. P.
Scotland	567,886	533,128	554,406	472,190
England	891,521	669,373	1,092,760	890,298
Ireland	159,633	107,100	151,922	109,300

Total U. K. 1,619,040 1,309,601 1,799,088 1,471,788

Thus Scotland shows an actual increase of 13,480 tons in spite of the growing depression in shipping.

The output of each Clyde yard in 1902 was as follows:

	Tons.		Tons.
Russel & Co.	55,585	The Ailsa Co.	5,919
C. Connell & Co.	41,052	The Clyde Co.	5,103
W. Denny & Bros.	40,329	Mackie & Thomson....	4,193
D. & W. Henderson	39,849	Campbeltown Co.	3,204
Barclay, Curle & Co.	31,289	Alley & Maclellan....	3,157
The Fairfield Co.	30,300	Bow, McLachlan & Co.	2,951
A. Stephen & Sons	27,826	J. Fullerton & Co. ...	2,818
John Brown & Co.	26,260	Ritchie & Graham ...	2,346
Napier & Miller	18,708	The Ardrossan Co....	2,167
A. McMillan & Son	17,055	J. Shearer & Sons....	1,462
R. Duncan & Co.	15,613	Lobnitz & Co.	1,240
W. Beardmore & Co. ...	15,258	Scott & Sons	1,228
Scott & Co.	13,894	Geo. Brown & Co....	900
London & Glasgow Co.	13,835	W. Chalmers & Co....	850
A. Rodger & Co.	12,721	D. M. Cumming	347
Grangem'th & Grnk. Co.	12,404	W. Fife & Son	290
Caird & Co.	11,024	Cochran & Co.	278
A. & J. Inglis	10,875	Peter Macgregor	194
W. Hamilton & Co. ...	9,941	J. & J. Hay	185
D. J. Dunlop & Co. ...	8,670	The Irvine Co.	153
Wm. Simons & Co....	8,050	Hanna & Wilson	83
Fleming & Ferguson...	6,400	W. Jacks & Co.	68
Murdock & Murray...	6,083	R. Macallister & Son.	64
John Reid & Co.....	5,951	Other firms	98

The total for the yards named above is 518,270 tons in 1902, compared with 511,990 tons in 1901. The output in steam vessels from these yards in 1902 aggregated 475,504 tons as against 42,766 tons of sailing vessels. The number of steam vessels was 239 and of sailing vessels 73. The years 1901 and 1902 are the largest on record. The next largest was 491,074 tons in 1899. The output of 1892 was 336,414 tons; of 1882, 391,934 tons; of 1872, 230,347 tons; of 1862, 69,967 tons.

The Tyne, like the Clyde, also managed to better its last year's record. It was late in the season before the depression now so general on the northeast coast took effect on the yards, and it does not, therefore, tell on the output of the year. Wages have come down, and the operatives have in most cases accepted the reductions, recognizing that this is their share of a falling market. The strike of joiners has, however, caused a good deal of inconvenience, and some builders state that but for this they would each have had another vessel in this year's figures. Among the notable Tyne launches of the year mention may be made of the twin-screw cable steamer *Colonia*, built by Messrs. Wigham-Richardson & Co. This vessel left the Thames in July to lay the Vancouver-Fanning island section of the new Pacific cable, and, loaded with 3,549 knots, weighing 7,684 tons, she arrived at Vancouver island on Sept. 12. She began paying out on Sept. 18, and laid 3,455 knots without a hitch. This is the longest length of cable ever laid. The list also includes the Wilson-Furness-Leyland liner *Mayflower*, the largest yet built in the district, and the Durban floating dock built by Messrs. Swan & Hunter, which was wrecked on the way out:

TYNE OUTPUT IN 1902.

	Vessels.	Tons.
C. S. Swan & Hunter	11	58,322
Armstrong-Whitworth	13	52,039
Wigham-Richardson	12	37,355
Palmer's Co.	6	31,313
Hawthorn, Leslie & Co.	5	26,658
Northumberland Co.	6	24,790
Readhead & Sons	8	24,764
R. Stephenson & Co.	9	15,994
The Tyne Co.	5	15,271
Wm. Dobson & Co.	6	13,740
The Blyth Co.	4	9,352
Wood, Skinner & Co.	5	6,490
Smith's Dock Co.	31	3,725

J. T. Eltringham & Co.	9	1,770
J. P. Rennoldson & Sons	8	1,632
Hepple & Co.	2	240
John Lindsay	3	175
W. P. Huntley	1	66
The Union Co.
	144	323,705

Returns from the English yards show an increase of sixty-one vessels over last year, but a decrease of over 200,000 in tonnage and of over 220,000 in horse-power. The increase in vessels is mostly in the Thames district, and the decrease in tonnage in the Tees and Hartlepoons. The following table summarizes the work in England during the year:

	Vessels.	Tons.	I. H. P.
The Tyne	144	323,705	277,960
The Wear	67	230,670	159,450
Tees & Hartlepoons	74	195,114	111,600
The dock yards	5	51,560	12,500
The Thames	306	29,181	51,129
Western ports	67	27,022	19,165
The Humber	120	26,442	24,135
English channel ports	147	6,764	12,829
Bristol channel ports	7	1,063	605
	937	891,521	669,373

In 1901 the number of vessels built in England was 876, the tonnage 1,092,760 and the horse-power 890,298.

In the whole of Scotland the tonnage and horse-power produced during 1902 was as follows:

District.	Vessels.	Tons.	I. H. P.
Clyde	312	518,270	480,870
Forth	38	12,980	12,580
Tay	29	24,255	28,800
Dee	25	12,431	10,878
	404	567,886	533,128

In 1901 the number of vessels produced in these districts was 376, the tonnage 554,406 and the horse-power 472,190, so that there is an increase in all three items.

LARGE NUMBER OF STEEL SAILING SHIPS.

A feature of the year's work was the number of large sailing ships launched. A. McMillan & Son, Dumbarton, turned out seven of 17,055 tons, ranging in size from 1,945 to 3,283 tons. A. Rodger & Co., Port Glasgow, launched four of from 1,959 to 3,090 tons; Wm. Hamilton & Co., Port Glasgow, one of 1,951 tons; John Reid & Co., Whiteinch, two of 2,400 tons and one of 760 tons; and the Ailsa company, Troon, one of 1,760 tons. Altogether, the list contains sixteen sailing ships—all steel.

Russel & Co. have for the sixth consecutive year the greatest tonnage to their credit. Connell & Co. step from third place, which they occupied last year, to second, while Denny & Bros. follow with very nearly the same tonnage.

The aggregate of the Clyde marine engineering is not only greater than that of last year but is also the second largest since 1890. The total indicated horse power for 1902 is 480,870, compared with 440,125 in 1901. Firms credited in the past year with 10,000 I. H. P. or more are:

	Total I. H. P.		Total I. H. P.
Fairfield Co.	45,750	A. Stephen & Sons.....	23,540
Denny & Co.	41,920	Dunsmuir & Jackson....	22,600
D. & W. Henderson....	35,300	W. Simons & Co.	12,545
D. Rowan & Co.....	31,500	Ross & Duncan.....	12,225
Scott & Co.	31,100	A. & J. Inglis.....	12,170
W. Beardmore & Co....	27,900	Rankin & Blackmore...	11,650
London & Glasgow Co.	25,500	Muir & Houston.....	11,410
Barclay, Curle & Co. ..	25,250	J. G. Kincaid & Co.....	11,200
John Brown & Co.....	24,500	Caird & Co.....	10,000

DEPRESSION AND LOWER WAGES INEVITABLE.

All through the year the tonnage launched has, month after month, been in excess of that reported as booked, and there has been a gradual clearing off in the work on the stocks, until now there are a large number of vacant berths. This in itself is a significant fact, and the builders themselves say they have rarely found it so hard to obtain orders. Already in the lower reaches of the river several of the yards are closed, so far as actual ship building is concerned, and unless prospects brighten the remainder of the winter will be a hard time. The enormous output of the past year has cleared many of the order books, and those yards which are busy are principally those which do not depend on general trading steamers, but are always well employed on warships or other special work. At this time last year the tonnage on hand in Scotland was estimated at 430,000 tons. The aggregate now on hand is estimated at about 362,000 tons. This, however, is very unequally distributed. There are in it two huge battleships, four first-class cruisers and probably the new Cunarders, vessels themselves aggregating nearly 100,000 tons. Apart from the yards where these vessels are to be built a period of depression seems inevitable. That it has already begun is evident, for one thing, from the reports of the different trade unions interested in the industry. The report of the As-

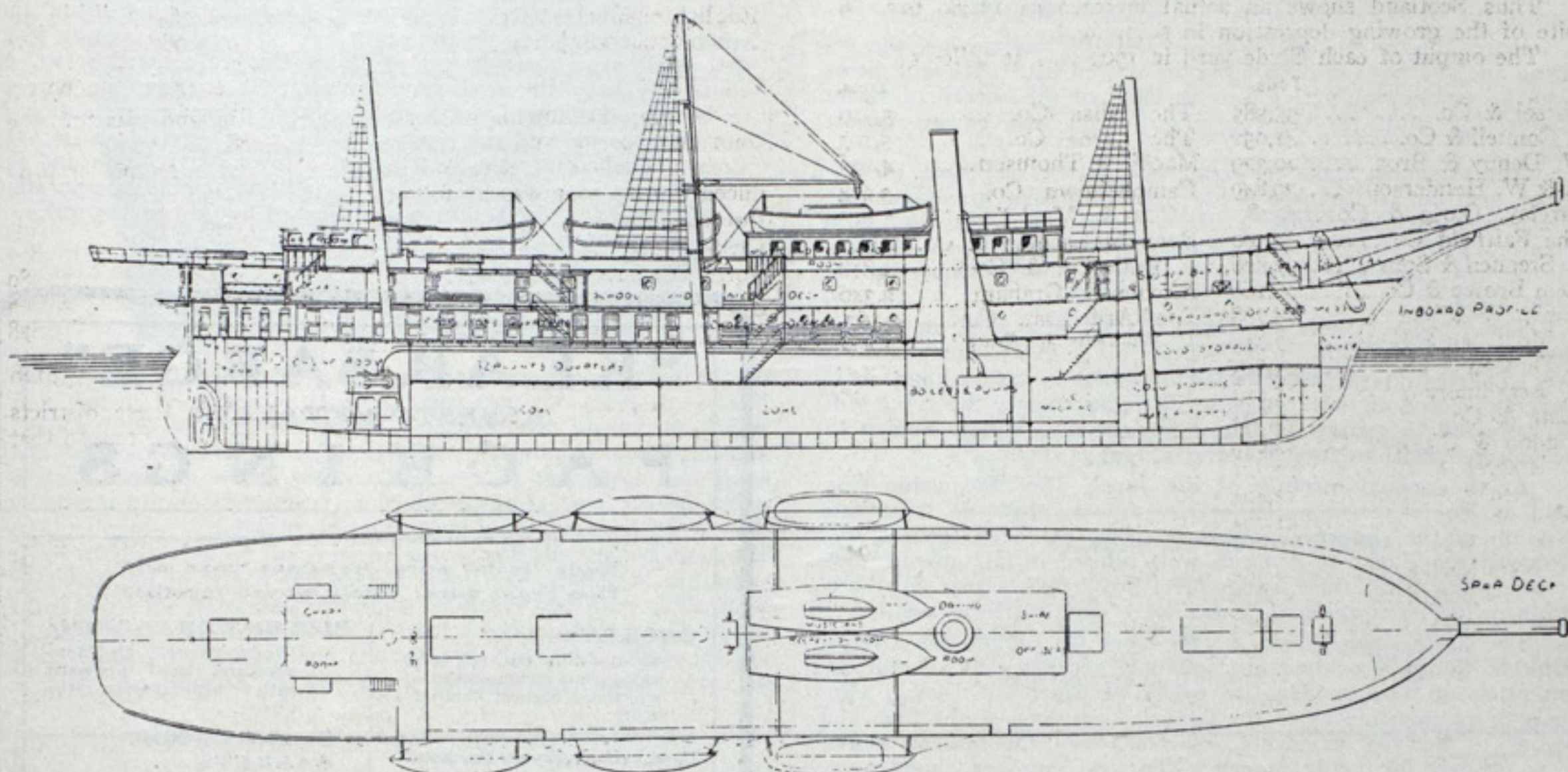
sociated Carpenters and Joiners, just issued by the secretary of the society, states that during the month of November 170 members were in receipt of unemployed benefit, 257 in receipt of sick benefit, nine members had been removed by death, and eighty-four new members had joined the several branches. Notices of reductions in wages to take effect in the ship yards in February, have been issued by the Clyde Ship Builders' Association. Roughly speaking, Clyde builders have on hand orders for about 342,000 tons; Forth builders about 4,500 tons; Tay builders about 10,500 tons, and Aberdeen builders about 4,000 tons.

SAILING SHIP YOUNG AMERICA.

The Nautical Preparatory School of Providence, R. I., has given a contract to the Perth Amboy Ship Building & Engineering Co., Perth Amboy, N. J., for a full-rigged sailing ship with auxiliary steam power to be used as a private schoolship. She will be of the most advanced type of modern steel construction and her general dimensions will be as follows: Length over all, 262 ft.; length on load water line, 230 ft.; beam, 40 ft.; draught, 19 ft.; displacement about 3,000 tons. The vessel will have the

commission on the port of London, which reported in favor of dredging a channel 36 miles long from the Nore to the Royal Albert dock, to be 30 ft. deep at low tide, and 1,000 ft. wide for a distance of 29 miles and 600 ft. for the balance; thence about 9 miles to the London docks, 25 ft. deep, at a cost, including the completion of certain river accommodation work of £2,500,000, or about \$12,500,000. Then the docks must be purchased and put into condition and fitted for modern needs, at a cost of £24,500,000, or about \$122,500,000, making a total, to fit the port of London to do a successful and competing business at the present day, of £27,000,000, or about \$135,000,000.

"Liverpool, in addition to \$200,000,000 already expended on its system of docks, is spending yet more in dredging and increasing its dockage accommodation for twentieth-century ships. Bristol, England, is another port aroused to the requirements of the day and, with a population of only 318,000, recently procured an act of parliament to permit the expenditure of the large sum of \$13,875,000 for the improvement of the port at Avonmouth, in order to provide twentieth-century accommodations to steamships. These projects are perfected and the work well



The Sailing Ship Young America.

old sailing frigate divisions of spar deck, main or school deck, berth deck, orlop deck and hold. She will have double bottoms throughout her entire length and will be subdivided into five watertight compartments. The ship will be lighted throughout by electricity. The purpose of this vessel is purely educational. She will tour the world while the students are studying.

BOSTON WANTS A DRY DOCK.

In its annual report just out the board of harbor and land commissioners calls attention to the inadequacy of the present dry dock accommodations at Boston. The report says:

"The usefulness of the new dry dock at the Charleston navy yard for merchant vessels will be wholly contingent upon whether or not it may be occupied or needed for war vessels, the growing number of which renders the chance for merchant vessels a constantly decreasing quantity. It may be safely said that no leading port abroad is so deficient in this respect as Boston, as, for instance, at Liverpool there are twenty-four dry or graving docks, at Antwerp ten, at Southampton five or more, one of which is 750 ft. long; the largest, 925½ ft. long, is at Liverpool. It would be unfortunate if, after the other requirements of a first-class port had been complied with, opportunity for docking in case of needed repairs should be found lacking. Economical reasons for making repairs on the other side of the Atlantic are diminishing, and when the time comes that repairs can be made as cheaply and advantageously at this port as elsewhere, a new and valuable industry offers itself for encouragement."

About the improvements in Boston harbor as compared with other ports, the report says: "It is encouraging to realize that the port of Boston, although still awaiting further improvements, is not less prepared than other great ports, both here and abroad, for the floating of modern steamships. Not only is New York having its harbor channels widened and deepened, and Liverpool having new docks built with lower gate sills, but London has been awakened by loss of trade to the necessity of overhauling its dock system and deepening the channels of the Thames. At London, with its population of 6,000,000 in 1899, goods were imported of the valuation in round numbers of £164,000,000, or about \$820,000,000. Nevertheless the falling off in the entrepot trade led to the appointment of a parliamentary

advanced. Already these increased facilities are attracting attention, and a new line between Bristol and Boston is under negotiation. As compared with the sums spent on harbors abroad, such as \$200,000,000 at Liverpool, \$74,000,000 at Glasgow, \$39,000,000 at Hamburg, \$28,000,000 at Havre, \$26,500,000 at the Tyne ports, \$26,000,000 at Rotterdam, \$25,000,000 at Antwerp, \$23,000,000 at Marseilles, \$13,800,000 at Melbourne and \$11,400,000 at Bombay, the amounts so far expended for the improvement of the port of Boston do not seem large. When all the present projects shall be completed, the harbor of Boston, in point of approach, entrance, protection, depth, area, anchorage, convenience and port charges, will compare favorably with any of those above named."

MORAN BROS. CO., SEATTLE, WASH.

Moran Bros., Seattle, Wash., recently launched the light-house tender Heather in the presence of a number of naval officers from the Puget Sound navy yard. This vessel has already been comprehensively described in the Review. The Heather is of the following dimensions: Length over all, 178 ft. 6 in.; beam, molded, 28 ft. 6 in.; depth of hold from top of keel to top of beam amidships, 14 ft. 11 in. The boilers and machinery are now being installed and it is expected to deliver the vessel to the government in about three months.

There are nearing completion at the works of Moran Bros. Co. two steel tugs 90 ft. long, the Wyadda and Bahada, for the Puget Sound Tug Boat Co. The propelling machinery of these vessels consists of one single-ended cylindrical boiler, 11 ft. in diameter and 11 ft. long, allowed a working pressure of 160 lbs. and a compound engine with cylinders of 13 and 30 in. diameter and stroke of 24 in. The auxiliary machinery is to be complete, including steam capstan and windlass and electric light plant.

The framing of the battleship Nebraska is nearly complete for the lower structure. The machinery for the vessel is also well under way.

New boilers and machinery are being installed in the steamships Umatilla and Cottage City, both belonging to the Pacific Coast Steamship Co. New boilers are being installed in the steamers Mainlander and George E. Starr.

ITEMS OF GENERAL INTEREST.

Mr. C. P. Nicholson of the Nicholson Ship Log Co., Cleveland, is at the Norfolk navy yard equipping the torpedo boat destroyer Truxton with one of the Nicholson logs.

Rear Admiral Frank Wildes, second in command at the Asiatic station, has been "condemned" by a medical board and ordered home. He commanded the Boston in the battle of Manila.

It is expected that the armored cruiser Pennsylvania will be launched at Cramps during the next two or three weeks. She will be christened by a daughter of Senator Quay. The Pennsylvania's displacement will be 13,680 tons.

It took a total of 382,040 tons of coal to keep up steam in the vessels of the United States navy during the year ended June 30, 1902, at an average cost of \$5.81 per gross ton on board the vessel. This compares with \$7.01 for the previous year.

The submarine torpedo boat Adder has been accepted by the government, subject to a penalty of \$960 for failure to comply with certain requirements as to speed. If the other submarines exceed the speed requirements this penalty will be refunded.

Rear Admiral George Wallace Melville has reached the retiring age and has been put upon the retired list. He will, however, be retained on active duty as chief of the bureau of steam engineering until his term expires, which will be in August next.

The Canadian Lake & Ocean Navigation Co., Ltd., of Toronto, sent out last week a pretty little Christmas greeting. The cover was decorated with a life preserver in white and gold (truly a good idea) printed against the faintest blush of blue. On the rear page was a picture of the first turret steamer on the great lakes.

The Newport News ship yard has recently tried an experiment that is expected to prove successful. A dozen young women are employed in the drafting department as tracers and it is understood that if they can meet all requirements the force will be increased to 100 girls. These are the first young women to be engaged in the actual construction of a ship.

At the annual meeting of the Japan Mail Steamship Co., held at Tokio recently, the report showed that the American division of the company's operations had not been satisfactory. Cargoes from Japan to America were offered in fair quantity but at low rates, while the cargoes furnished by the Great Northern Railway for transpacific shipment were comparatively small.

The Morse Iron Works & Dry Dock Co., which has a large plant in South Brooklyn, has found it necessary to ask for an extension of time on \$450,000 worth of paper. It is said that there is no question as to the financial standing of the firm but owing to delayed payments, especially on government work, it is pressed for ready money. The firm employs about 2,000 men.

Congressman Hill has introduced a bill in the house of representatives to appropriate \$1,000,000 for the purchase of submarine boats of a type which shall make the best showing in a competitive test before the officials of the United States navy at Washington next June. This has special reference to the lake type of submarine boat, the invention of Simon Lake of Bridgeport, Conn.

Members of the underwriting syndicate of the International Mercantile Marine Co. have been called upon to pay within the next week a 10 per cent. installment on their subscriptions. The installment is \$5,000,000. Three calls have previously been made, two for 25 per cent. each and a third for 30 per cent., making a total so far called of \$45,000,000. The latest call is for the purpose of paying for vessels now under way, both in this country and in Britain, for the combine.

Senator Elkins has developed into one of the most earnest advocates of a larger navy. He has become a most strenuous disciple of President Roosevelt in this regard. "We should

build," said he, "fifty more battleships before paring down our naval appropriations. We should make liberal provision for four more battleships at the present session, and if I understand the sentiment among the members of the senate we are going to get a substantial increase. It is idle for us to close our eyes to the possibility that we may sooner or later become involved in a war with one of the great powers of Europe as the result of our new policy of territorial expansion. The time has come to keep our army and navy up to the highest standard of efficiency."

The present coal famine has apparently set to work the wits of Mr. A. G. Whitney of Chicago. He has evolved a plan for drawing unlimited heat from the firmament and has progressed so far as to incorporate his company under the laws of South Dakota with a capital stock of \$56,000,000. As everyone knows the atmosphere in which we live extends to a height of 17 miles above the earth's surface. At that point gravitation is from and not towards the earth. About 250 miles above the line of atmosphere Mr. Whitney has discovered an unlimited supply of crude electricity which has been running to waste for millions of years. He proposes to project a wire into this strata and conduct the electricity to the earth. As gravitation is away from the earth at a distance of 17 miles this force will serve, of course, to keep the wire taut forever. As to how the wire is to be projected the first 17 miles Mr. Whitney's explanation is not clear to the ordinary mind but he concludes that it is very simple and involves the building of a tower 60 ft. high and the construction of a storage tank. In addition to the incorporation of the company Mr. Whitney has secured figures on 125 miles of wire.

"KEARSARGE" ASBESTO-METALLIC PACKINGS

Made from pure Asbestos yarn and fine brass wire, firmly woven together

GASKETS

will not blow out, will hold against any steam pressure, will stand highest temperature.

Used exclusively on the hand holes of Babcock & Wilcox and other water-tube boilers.

SHEET PACKING

The most reliable flat packing on the market for all conditions of steam service

PISTON ROD PACKING

For high speed, high temperature, high pressure, with or without wire interwoven.

FLANGE JOINT GASKETS

More reliable than rubber or metallic and cost much less. Will not blow out. Unaffected by high temperature. Without expansion or contraction. Works perfectly whether conditions are favorable or unfavorable.

Write for samples, prices and full information.

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MANITOWOC DRY DOCK COMPANY, SHIP BUILDERS.

FACILITIES FOR REPAIRS OF STEEL AND WOODEN VESSELS.

DRY DOCKS AND MAIN OFFICE: MANITOWOC, WIS.
GEO. B. BURGER, SUPT.

BRANCH YARD: 34 ROBERTS STREET, CHICAGO.
THEODOR KNUDSON, SUPT.

United Marine Mfg. & Supply Co.,

MANUFACTURERS OF AND
DEALERS IN

ALBERT C. JAHL, General Manager,
100 William St., New York, U. S. A.

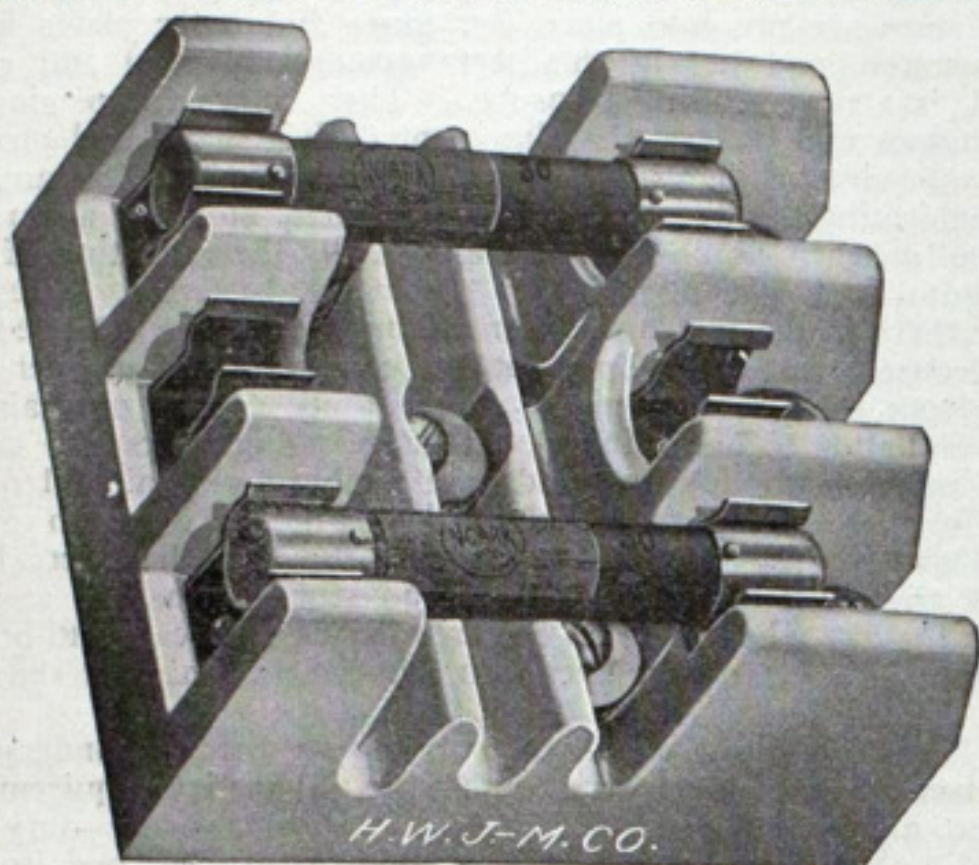
ELECTRICAL MATERIAL

FOR SHIPS AND FORTIFICATIONS.

BRANCH FUSE BLOCKS.

A bulletin from the H. W. Jones-Manville Co., 100 William street, New York, thus describes the Noark branch fuse block:

"Appreciating the demand for enclosed fuse branch blocks, we have perfected the line of single branch blocks herewith illustrated, which contain features of merit that will unquestionably appeal to the constructing engineer and other users of such devices. We have departed from the usual arrangement for branch block devices, in which the fuses for the branch circuits abutt at right angles to the outside of the two or three parallel main wires.



This construction requires a block of some size, owing to the fact that it is necessary to give space for the main wires and branch fuses separately. In the Noark branch blocks the object has been to economize space and at the same time produce a branch block in which the arrangement of the wires and fuses should be absolutely safe, both in the operation and manipulation of the device. To obtain this result we have arranged the branch fuses so that each of the terminals in which the branch fuses are received and to which the branch wires are connected are separated from the adjoining terminals by heavy partition walls, high enough above the contacts to prevent anything being laid across from contact to contact and cause short-circuiting. This feature is also predominant in our main blocks. The main wires to

which the branch block is connected, instead of passing across the block at the end of the branch fuses, are arranged to traverse it in suitable grooves placed in the porcelain block between the terminals of the branch fuses. In this way a great economy of space is effected, while at the same time the block can be easily and readily installed and the manipulation of the fuse devices for a removal or insertion is entirely safe."

Admiral Bowles, chief constructor of the navy, has recommended to Secretary Moody that the men engaged in the construction of the battleship Connecticut in the Brooklyn navy yard be paid by the piece instead of by the day. He thinks the disadvantage which the government suffers in its contest with the Newport News Ship Building & Dry Dock Co., which is building the Louisiana, a sister ship, will be minimized by this system. The government's day is eight hours; that of the ship building company ten.

Steam Barge and Consort for Sale.

Steamer 119 ft. 6 in. long; 25 ft. 7 in. wide; 9 ft. 4 in. deep; capacity, lumber 270 M ft.; coal 385 tons. Engine high pressure 20x20; new boiler, allowed 150 lbs. steam. Everything pertaining to this boat in first-class condition.

Consort 133 ft. 8 in. long; beam 25 ft. 4 in.; 10 ft. 8 in. deep; capacity lumber 375 M. ft.; coal 575 tons. Hull in good condition; now receiving new spars and other repairs. Terms, cash. Address Box 804 Marine City. Jan 22

Large Tug for Sale.

Large lake tug for sale. In good condition, fitted out for raft towing. Inquire, Frank Perry, Sault Ste. Marie, Mich. Mar. 9

Steam Barge for Sale.

Steam barge for sale, half or whole. Rates A-2. Capacity 700,000 ft. of lumber. Light draught; 120 lbs. of steam. For particulars apply to J. E. Miller, 23 Lodge avenue, Cleveland, O. Jan. 15.

BELLEVILLE WATER-TUBE BOILERS

NOW IN USE (AUGUST, 1902)

On Board Sea-going Vessels, NOT INCLUDING New Installations Building or Erecting.

French Navy	-	-	-	-	-	-	-	-	268,020 H. P.
English Royal Navy	-	-	-	-	-	-	-	-	745,900 "
Russian Imperial Navy	-	-	-	-	-	-	-	-	184,900 "
Japanese Imperial Navy	-	-	-	-	-	-	-	-	110,700 "
Austrian Imperial Navy	-	-	-	-	-	-	-	-	32,900 "
Italian Royal Navy	-	-	-	-	-	-	-	-	13,500 "
Chilian Navy	-	-	-	-	-	-	-	-	26,500 "
Argentine Navy	-	-	-	-	-	-	-	-	13,000 "
The "Messageries Maritimes" Company	-	-	-	-	-	-	-	-	87,600 "
Chemins de fer de l'Ouest: (The French Western Railway Co.)	-	-	-	-	-	-	-	-	Steamships
plying between Dieppe and Newhaven	-	-	-	-	-	-	-	-	18,500 "
Total Horse Power of Boilers <u>in Use</u>	-	-	-	-	-	-	-	-	1,501,520

WORKS: Ateliers et Chantiers de l'Ermitage, at Saint-Denis (Seine), France.

TELEGRAPHIC ADDRESS: Belleville, Saint-Denis-Sur-Seine.

TRADE NOTES.

The yacht *Bacchante* has recently been sold through the agency of Frank N. Tandy, 31 State street, Boston, to Mr. T. H. Dougherty of Philadelphia by the George Lawley & Son Corporation. Mr. Richmond, the former owner, gave *Bacchante* in part payment for a larger boat, which Lawley & Son are now building for him. The *Bacchante* was designed by Fred Lawley and built at the Lawley works in 1900. She is 55 ft. over all, 35 ft. load water line, 18 ft. 6 in. beam and 8 ft. draught.

A ring of wire insertion Asbestos high-pressure packing that was in constant use for six years will be shown by the H. W. Johns-Manville Co., 100 William street, New York, to anyone interested. During its long service, this packing, which was recently removed from the steam end of a Worthington duplex compound pump used in the elevator service of the Woodbridge building, New York, never caused the engineer the slightest trouble. When removed it was in such excellent condition as to permit of further efficient service, notwithstanding its six years' use. The rod is still perfectly smooth. The packing worked under 125 lbs. pressure; pump capacity, 3,000,000 gallons every twenty-four hours.

Asbestos is a fibrous mineral and one of nature's unique products. It is found in various parts of the world and usually occurs in narrow veins or seams. When treated mechanically it yields soft, white, delicate and exceedingly strong fibers, which can be spun, woven and otherwise manufactured into many useful articles. Such is the observation in a catalogue issued by the H. W. Johns-Manville Co. upon the subject of asbestos. The catalogue numbers 100 pages and is a pretty thorough exposition of the uses to which asbestos can be put. The catalogue is carefully indexed, so that any subject can be determined upon at once. Anyone who is interested in this wonderful non-conducting material is advised to write for it.

Messrs. J. W. Duntley, J. R. McGinley, Jos. Bover, W. O. Duntley and J. B. Milliken, a committee representing the directors of the Chicago Pneumatic Tool Co., have returned to Chicago after a visit of inspection to the various plants of the company. In speaking of the trip one of the gentlemen said: "This tour was one of the most pleasant experiences I have had for some time. We visited the air compressor works of the company at Franklin, Pa., first, and were highly pleased with the condition of affairs there. The facilities of this factory are taxed to their utmost capacity. From Franklin we visited the works at Cleveland, Detroit and Aurora, Ill., and are very well satisfied with the conditions everywhere. In some instances we found the plants working night and day forces. We must increase the

facilities of some of our plants considerably. Steps will be taken in the near future to make the necessary additions.

BUILDING A BATTLESHIP.

In a recent magazine article Irving M. Scott of the Union Iron Works, San Francisco, writes regarding the building of a battleship as follows:

"Engines are manufactured; houses are built; a ship is created. Therein lies the joy of her construction. There is nothing so fascinating as to watch the keel of a ship laid, true as a compass, straight as a shaft of light. Her daily progress as her frames are put into place, her inner and outer plates fitted and secured, and her internal arrangements planned and completed, is a never-ending pleasure. Then comes the placing of her engines and boilers, the alignment of her shafts and propellers, the electric lighting and refrigerating plants, means of communication between her different parts, steering apparatus with all its various modifications and finally the mounting of her big guns and placing of her secondary batteries. Besides these, there is the storing of her ammunition to be attended to, the electric hoists to be built for the conveyance of powder and shell from their storage places to the guns, system of drainage and ventilation to be perfected, the surgeon's quarters and stores to be made ready for use, and comfortable and healthful quarters for the sailors to be planned. Finally, when in every detail she is in perfect order, when a thousand hammers have struck their last blow and a thousand sturdy arms are at rest, comes the day when we send the creation of our heart and brains out into the great ocean, uncertain ourselves as to what she will do.

"It is triumph—triumph more than any man can understand who has not known it, when under the exhaustive requirements of the government she successfully performs every duty required. And when finally we are able to turn her over to the government with a record unexcelled, our pride in her is increased two-fold. The last, the greatest joy of ship building has been ours in one instance. When the United States asked the best that a ship could do, the Oregon did not fail. She responded readily to the intelligences which set her heart throbbing and her nerves quivering. She astonished the world in the performance of all her great tasks."

Naval Constructor Frank W. Hibbs recently resigned from the service to accept the position of naval architect and assistant manager with the Moran Bros. Co., Seattle, Wash.

THE CLEVELAND TRUST COMPANY

Capital \$500,000.00

Surplus \$575,000.00

PAYS four per cent interest on time deposits—two per cent on check accounts.

ACTS in any fiduciary capacity—as trustee of bond issues; as registrar and transfer agent of the stock of corporations; as a disinterested third party carrying out the provisions of an agreement between two interested parties.

STORES anything of value for any length of time. Individual safes in a burglar-proof and fire-proof vault. Largest and best safe deposit equipment in Ohio.

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121 EUCLID AVENUE, AT THE CORNER OF BOND STREET.

Commenced Business June 3, 1901.

4 Per Cent. on Savings.



CAPITAL \$1,500,000.

Surplus and Undivided Profits (Earned) \$152,000.

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Fred T. POMEROY, Treas. and Gen. Mgr. Cleveland, Elyria & Western Ry.
WILLIAM H. HUNT, Gen. Mgr. The Cleveland Hydraulic Press Brick Co.
WM. O. MATHEWS, Lamson & Mathews, Attorneys-at-law.

GREAT STRUGGLE FOR PACIFIC TRADE.

From New York to San Francisco in $3\frac{1}{2}$ days is the task E. H. Harriman has set out to accomplish. He says it will be accomplished within three years. He has taken the Pennsylvania railroad as his model, and declares that as fast as men and money can make the change the Union and Southern Pacific systems from Omaha to San Francisco will be in every respect equal to the Pennsylvania road from New York to Chicago. Millions are now being expended, he says, in straightening the road from Omaha westward, and the work of rebuilding the Southern Pacific from Ogden will follow. The Sierras are to be tunneled so that the grades will be no greater than those found on the lines east of Ogden. Mr. Harriman's declaration of his purpose in pouring out millions on the central continental highway was called out because of the struggle now going on for the lion's share of transpacific commerce between James J. Hill and the Northern Pacific interests on the one hand, and E. H. Harriman and the Union-Southern Pacific on the other. The fight arose over the attempt of James J. Hill and his allies to wrest control of the government transport business from San Francisco and transfer it to Seattle. The outcome of the first round of the fight, which was decided by Secretary Root last week, was in a sense a victory for Seattle, though a part of the government service will be operated as usual from San Francisco. Mr. Harriman informed Secretary Root that he was expending tens of millions of dollars in the construction of the Union Pacific. He said the distance was being shortened, curves reduced, grades cut down, steel and stone culverts put in and the heaviest steel rails laid. Plans are being perfected for a tunnel under the Sierra Nevada range, near Truckee, Cal., which will permit a descent into the Sacramento valley on an easy grade. With these improvements completed the time from New York to San Francisco will be reduced to $3\frac{1}{2}$ days.

Meantime, improvements on the sea are coming fast. The Pacific mail has already in service the Korea, the largest steamship yet built in the United States, and it is engaged in clipping the record between San Francisco and the Orient. Her sister ship, the Siberia, is on her way around the Horn. Agents of the company are scattered through the Orient from Vladivostok to Adelaide drumming up business. The Pacific mail, in addition to the Korea, Siberia and China, of its own line, controls the Coptic, Doric and Gaelic of the Occidental & Oriental Line, and the Hong Kong Maru, Nippon Maru and the American Maru of the Toyo Kisen Kaisha Line, all operated on schedules that give frequent service out of San Francisco.

Cabins and Staterooms

of modern vessels, especially those in the passenger service, should demonstrate the supreme possibilities of the wood finisher's art.

This demands a special varnish, however, as atmospheric conditions are more destructive to varnish afloat than ashore and the ordinary article is of but little use.

The varnish best adapted to withstand the deleterious influences of wind, wave and weather is "**BERRY BROTHERS' SPAR VARNISH.**"

Further particulars and a unique marine puzzle sent free for the asking. Write us.

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PERSONAL.

Mr. Hamilton Matteson, jr., has resigned his position with the marine department of the Standard Oil Co. to open offices in Philadelphia, representing standard lines of marine supplies. Mr. Matteson had been connected with the Standard Oil Co. in various capacities for twenty-three years, and in the last ten years held the position of marine superintendent. During his long term of service with the Standard he has made a host of friends and has established an enviable reputation both for ability and integrity in business dealings, which will prove of great assistance to him in his new venture. He has also decided to take up the business of consulting engineer, and has had a large and varied experience in this line, obtained from construction and repair of the Standard Oil fleet, in which he has taken part almost from its inception. Mr. Matteson hopes to open his new offices at 690-692 Philadelphia Bourse about Jan. 15, and will start out with the best wishes of his many friends and old associates.

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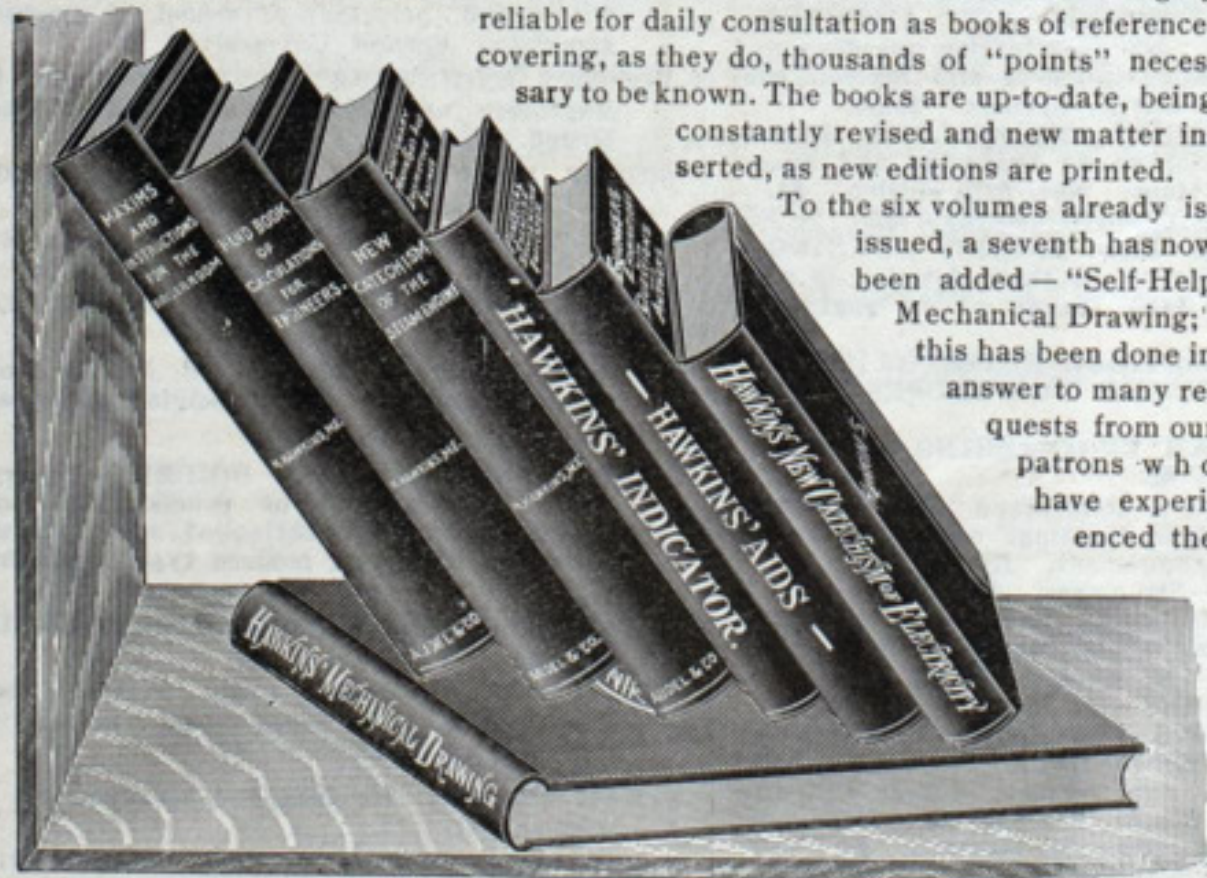
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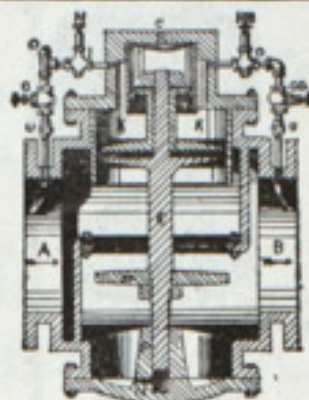
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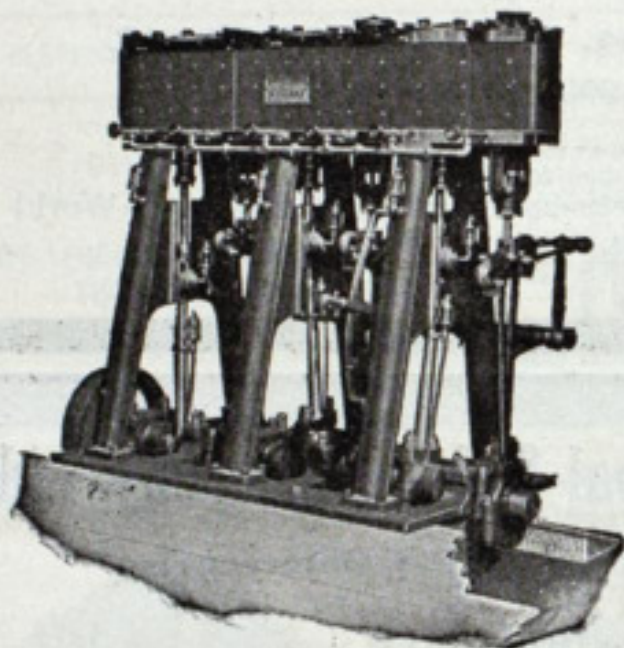
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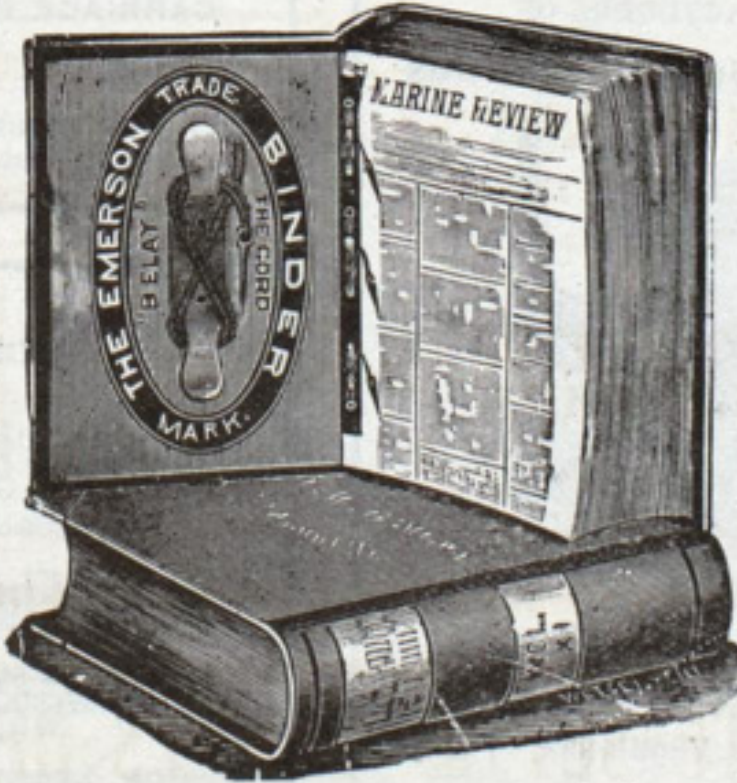
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Chicago Pneumatic Tool Co. Chicago.
General Electric Co. Schenectady, N. Y.
Lidgerwood Mfg. Co. New York.
Q. & C. Co. Chicago.
Westinghouse Electric & Mfg. Co. Pittsburg.
Wood & Co., R. D. Philadelphia.

DEAD-LIGHTS, AIR-PORTS, ETC.

"Long-Arm" System Co. Cleveland.

DRAWING MATERIALS.

Schweneke, Kirk & Co. New York.

DIVING APPARATUS.

Morse, A. J. & Son. Boston.
Schrader's Son, A. New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

Cleveland Punch & Shear Works Co. Cleveland.
Q. & C. Co. Chicago.

DRYING APPARATUS.

Buffalo Forge Co. Buffalo.
Sturtevant, B. F. Co. Boston.

DRY DOCKS.

American Ship Building Co. Cleveland.
Atlantic Works. East Boston, Mass.
Baltimore Ship Building Dry Dock Co. Baltimore.
Bath Iron Works, Ltd. Bath, Me.
Buffalo Dry Dock Co. Buffalo.
Chicago Ship Building Co. Chicago.
Craig Ship Building Co. Toledo, O.
Cramp, Wm. & Sons. Philadelphia.
Detroit Ship Building Co. Detroit.
Harlan & Hollingsworth Co. Wilmington, Del.
Lockwood Mfg. Co. East Boston, Mass.
Manitowoc Dry Dock Co. Manitowoc, Wis.
Marine Construction & Dry Dock Co. New York.
Maryland Steel Co. Sparrow's Point, Md.
Milwaukee Dry Dock Co. Milwaukee.
Moran Bros. Co. Seattle, Wash.
Newport News Ship Building Co. Newport News, Va.
Nixon, Lewis. Elizabeth, N. J.
Pusey & Jones Co. Wilmington, Del.
Shipowners Dry Dock Co. Chicago.
Superior Ship Building Co. Superior, Wis.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co. Cleveland.
General Electric Co. Schenectady, N. Y.
Lidgerwood Mfg. Co. New York.
Westinghouse Electric & Mfg. Co. Pittsburg, Pa.

ELECTRIC FIXTURES AND APPLIANCES.

General Electric Co. Schenectady, N. Y.
Page Bros. & Co. Boston.
Seidler-Miner Electric Co. Detroit.
United Marine Mfg. & Supply Co. New York.
Westinghouse Electric & Mfg. Co. Pittsburg, Pa.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co. Buffalo.
Electro-Dynamic Co. Philadelphia.
Elwell-Parker Electric Co. Cleveland.
General Electric Co. Schenectady, N. Y.
Seidler-Miner Electric Co. Detroit.
Sturtevant, B. F. Co. Boston.
United Marine Mfg. & Supply Co. New York.
Westinghouse Electric & Mfg. Co. Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co. Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co. Cleveland.
Atlantic Works. East Boston, Mass.
Bath Iron Works, Ltd. Bath, Me.
Bell Engineering Works, David. Buffalo.
Buffalo Forge Co. Buffalo.
Chicago Ship Building Co. Chicago.
Chase Machine Co. Cleveland.
Craig Ship Building Co. Toledo, O.
Cramp, Wm. & Sons. Philadelphia.
Dake Engine Co. Grand Haven, Mich.
Detroit Ship Building Co. Detroit.
Fletcher, W. & A. Co. Hoboken, N. J.
Fore River Ship & Engine Co. Quincy, Mass.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated. New York.
Great Lakes Engineering Works. Detroit, Mich.
Hall Bros. Philadelphia.
Harlan & Hollingsworth Co. Wilmington, Del.
Jenks Ship Building Co. Port Huron, Mich.
Lake Shore Engine Works. Marquette, Mich.
Lockwood Mfg. Co. East Boston, Mass.
Marine Iron Works. Chicago.
MacKinnon Mfg. Co. Bay City, Mich.
Maryland Steel Co. Sparrow's Point, Md.
Milwaukee Dry Dock Co. Milwaukee.
Moran Bros. Co. Seattle, Wash.
Mosher, Chas. D. New York.
Neafie & Levy Ship & Engine Bldg. Co. Philadelphia.
Newport News Ship Building Co. Newport News, Va.
Nixon, Lewis. Elizabeth, N. J.
Pusey & Jones Co. Wilmington, Del.
Risdon Iron Works. San Francisco.
Roach's Ship Yard. Chester, Pa.
Thropp, J. E. & Sons Co. Trenton, N. J.
Sheriffs Mfg. Co. Milwaukee.
Superior Ship Building Co. Superior, Wis.
Trigg, Wm. R. Co. Richmond, Va.
Trout, H. G. Buffalo.
Warrington Iron Works. Chicago.
Willard, Chas. P. & Co. Chicago.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.
Cory, Chas. & SonNew York.
Electro-Dynamic Co.Philadelphia.
Detroit Electric Signal Co.Detroit.
MacLean Hydraulic Signal Co.Chicago.
Seidler-Miner Electric Co.Detroit.

ENGINEERING BOOKS.

Andel & Co., Theo.New York.
Marine Review Pub. Co.Cleveland.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co.Chicago.
Farnan Brass WorksCleveland.
Kieley & MuellerNew York.
McCutcheon, C. H.Buffalo.
Relly Repair & Supply Co., James.New York.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.

Electro-Dynamic Co.Philadelphia.
Garrett-Cromwell Engineering Co.Cleveland.
Gaskin, EdwardBuffalo.
Goodenough, WalterNew York.
Hunt, Robt. W. & Co.Chicago.
Kidd, JosephDuluth, Minn.
Logan, RobertCleveland.
Mosher, Chas. D.New York.
Newman, R. L.New York.
Pittsburg Testing Laboratory, Ltd.Pittsburg.
Powell, Ambrose V.Chicago.
Roelker, H. B.New York.
Sadler, Perkins & Field.New York.
See, HoraceNew York.
Wood, W. J.Chicago.

EVAPORATING AND DISTILLING APPARATUS.
Relly Repair & Supply Co., James.New York.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.Buffalo.
Sturtevant, B. F. Co.Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, RobertBuffalo.
Relly Repair & Supply Co., James.New York.
Ross Valve Co.Troy, N. Y.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

General Electric Co.Schenectady, N. Y.
Page Bros. & Co.Boston.
Seidler-Miner Electric Co.Detroit.
Westinghouse Electric & Mfg. Co.Pittsburg, Pa.

FORGES.

Buffalo Forge Co.Buffalo.
Sturtevant, B. F. Co.Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.Cleveland.
Fore River Ship & Engine Co.Quincy, Mass.
Macbeth Iron Co.Cleveland.

FLUE WELDING.

Fix's, S. SonsCleveland.

FURNACES FOR BOILERS.

Continental Iron Works.New York.

FUELING COMPANIES AND COAL DEALERS.

Castner, Curran & Bullitt (Pocahontas)Phila.
Graham Coal & Coke Co.Detroit.
Hanna, M. A. & Co.Cleveland.
Pickands, Mather & Co.Cleveland.
Pittsburg Coal Co.Cleveland.
Rochester & Pittsburg Coal & Iron Co.Buffalo.
Smith, Stanley B. & Co.Detroit.
Youghlougheny & Lehigh Valley Coal Co.Chicago.

GAS BUOYS.

Safety Car Heating & Lighting Co.New York.

GAS AND GASOLINE ENGINES.

Chase Machine Co.Cleveland.
Lake Shore Engine Works.Marquette, Mich.

GAGES, STEAM AND VACUUM.

American Steam Gauge Co.Boston.
Ashton Valve Co.Boston.

GRAPHITE.

Dixon Crucible Co., JosephJersey City, N. J.

HAMMERS, STEAM.

Bell Engineering Works, DavidBuffalo.
Chase Machine Co.Cleveland.
Q. & C. Co.Chicago.

HARDWARE, SHIP.

Topky BrothersAshtabula, O.

HATCH GEARS.

"Long-Arm" System Co.Cleveland.

HEATING APPARATUS.

Buffalo Forge Co.Buffalo.
Sturtevant, B. F. Co.Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.Cleveland.
Brown Hoisting Machinery Co., Inc.Cleveland.
Chase Machine Co.Cleveland.
Elwell-Parker Electric Co.Cleveland.
General Electric Co.New York.
Hyde Windlass Co.Bath, Me.
Lidgerwood Mfg. Co.New York.
Marine Iron Co.Bay City.
Westinghouse Electric & Mfg. Co.Pittsburg, Pa.

HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co.Cuyahoga Falls, O.

HOSE FITTINGS.

Farnan Brass Works.Cleveland.

HYDRAULIC MACHINERY.

Watson-Stillman Co., The.New York.
Wood & Co., R. D.Philadelphia.

ICE MACHINERY.

American Linde Refrigerating Co.New York.
Roelker, H. B.New York.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.Boston.
Ashton Valve Co.Boston.

INJECTORS.

Crane Co.Chicago.
Jenkins Bros.New York.
Lunkenheimer Co.Cincinnati.
Penberthy Injector Co.Detroit, Mich.

INSURANCE, MARINE.

Brown & Co.Buffalo.
Brown, W. W.Cleveland.
Dunham, R. J.Chicago.
Elphicke, C. W. & Co.Chicago.
Hawgood & Co., W. A.Cleveland.
Hutchinson & Co.Cleveland.
Insurance Co. of North America.Philadelphia.
McCarthy, T. R.Montreal.
McCurdy, Geo. L.Chicago.
Mitchell & Co.Cleveland.
Peck, Chas. E. & W. F.New York and Chicago.
Richardson, W. C.Cleveland.
Sullivan, D. & Co.Chicago.
Weeks, F. H.New York.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.Cleveland.
Hanna, M. A. & Co.Cleveland.
Pickands, Mather & Co.Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Gas Engine & Power Co.New York.
Marine Construction & D. D. Co.
.....Mariner's Harbor, S. I., N. Y.
Marine Iron Works.Chicago.
Warrington Iron Works.Chicago.
Willard, Chas. P.Chicago.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co.Pittsburg.
Drein, Thos. & SonWilmington, Del.
Kahnweiler's Sons, D.New York.
Lane & DeGrootLong Island City, N. Y.
Marine Construction & D. D. Co., Mariner's Harbor,S. I. N. Y.

LIGHTS, SIDE AND SIGNAL.

Helvig, H. A. J.New York.
Page Bros. & Co.Boston.
Russell & WatsonBuffalo.

LOGS.

Walker & Sons, ThomasBirmingham, Eng.
Nicholson Ship Log Co.Cleveland.
Also Ship Chandlers.

MACHINISTS.

Chase Machine Co.Cleveland.
Macbeth Iron Co.Cleveland.
Union Machine & Boiler Co.Cleveland.
Ward Machine Co.Cleveland.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc.Philadelphia.

MACHINERY, NEW AND SECOND HAND.

Bowler & Co. Geo. H.Cleveland.
Clyde Machine Works.Chicago.

MAN-HOLES, SWING DOORS, ETC.

"Long-Arm" System Co.Cleveland.

MARINE RAILWAYS, BUILDERS OF

Crandall & Son, H. I.East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.New York.

MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co.Cleveland.
Bloomsburg & Co., H.Baltimore, Md.
Buffalo Forge Co.Buffalo.
Detroit Ship Building Co.Detroit.
Steam Boiler Equipment Co.New York.
Sturtevant, B. F. Co.Boston.

METALLIC PACKING.

Allen, JosephCollingswood, N. J.
Hayden Mfg. Co., N. L.Columbus, O.
Katzenstein, L. & Co.New York.
U. S. Metallic Packing Co.Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.Boston.

MOTORS, GENERATORS—ELECTRIC.

Buffalo Forge Co.Buffalo.
Electro-Dynamic Co.Philadelphia.
Elwell-Parker Electric Co.Cleveland.
General Electric Co.Schenectady, N. Y.
"Long-Arm" System Co.Cleveland.
Seidler-Miner Electric Co.Detroit.
Sturtevant, B. F. Co.Boston.
United Marine Mfg. & Supply Co.New York.
Westinghouse Electric & Mfg. Co.Pittsburg, Pa.

NAUTICAL INSTRUMENTS.

Bliss, John & Co.New York.
Ritchie, E. S. & SonsBrookline, Mass.

NAVAL ARCHITECTS.

Gaskin, EdwardBuffalo.
Goodenough, WalterNew York.
Kidd, JosephDuluth, Minn.
Logan, RobertCleveland.
Mosher, Chas. D.New York.
Newman, R. L.New York.
Sadler, Perkins & Field.New York.
See, HoraceNew York.
Wood, W. J.Chicago.

NAVAL STORES.

Day, Britton T. & S. P. Day.Cleveland.

OAKUM.

DeGrauw, Aymar & Co.New York.
Stratford Oakum Co.Jersey City, N. J.

OILS AND LUBRICANTS.

Dixon Crucible Co., JosephJersey City, N. J.
Standard Oil Co.Cleveland.

OIL FILTERS.

Haines Co., W. S.Philadelphia.

PACKING.

Allen, JosephCollingswood, N. J.
Crane Co.Chicago.
Hayden Mfg. Co., N. L.Columbus, O.
Jenkins Bros.New York.
Katzenstein, L. & Co.New York.
United States Metallic Packing Co.Philadelphia.

PAINTS.

Baker, Howard H. & Co.Buffalo.
Berry Bros., Ltd.Detroit.
Day's Varnish & Dryer Co.Cleveland.
Mohawk Paint & Chemical Co.New York.
New Jersey Zinc Co.New York.
Topky BrothersAshtabula, O.
Upson-Walton Co.Cleveland.

PATENT ATTORNEYS.

Thurston & BatesCleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc.Philadelphia.

PIPE—BRASS AND COPPER, IRON PIPE SIZE.

Waterbury Brass Co.New York.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.Cleveland.
Crane Co.Chicago.
Macbeth Iron Co.Cleveland.

PIPE, CAST IRON.

Wood & Co., R. D.Philadelphia.

PLANING MILL MACHINERY.

Atlantic Works, Inc.Philadelphia.

PLATE BENDING AND PLANING MACHINES.

Wood & Co., R. D.Philadelphia.

PLUMBING, MARINE.

Mott, J. L., Iron WorksNew York.
Relly Repair & Supply Co., James.New York.
Sands, Alfred B. & SonNew York.

PNEUMATIC TOOLS.

Allen, John F.New York.
Chicago Pneumatic Tool Co.Chicago.
Q. & C. Co.Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.Boston.

POWER DOORS AND HATCHES.

"Long-Arm" System Co.Cleveland.

PRESSURE REGULATORS.

Kieley & MuellerNew York.
Ross Valve Co.Troy, N. Y.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

PROPELLER WHEELS.

American Ship Building Co. Cleveland
 Atlantic Works East Boston, Mass.
 Baltimore Ship Building & Dry Dock Co. Baltimore
 Bath Iron Works, Ltd. Bath, Me.
 Cramp, Wm. & Sons Philadelphia
 Detroit Ship Building Co. Detroit
 Fore River Ship & Engine Co. Quincy, Mass.
 Great Lakes Engineering Works Detroit
 Hyde Windlass Co. Bath, Me.
 Harlan & Hollingsworth Co. Wilmington, Del.
 Jenks Ship Building Co. Port Huron, Mich.
 Lockwood Mfg. Co. East Boston, Mass.
 Macbeth Iron Co. Cleveland
 MacKinnon Mfg. Co. Bay City, Mich.
 Marine Iron Works Chicago
 Maryland Steel Co. Sparrow's Point, Md.
 Milwaukee Dry Dock Co. Milwaukee
 Moran Bros. Co. Seattle, Wash.
 Neafie & Levy Ship & Engine Bldg. Co. Phila.
 Newport News Ship Bldg. Co. Newport News, Va.
 Nixon, Lewis Elizabeth, N. J.
 Pusey & Jones Co. Wilmington, Del.
 Risdon Iron Works San Francisco
 Roelker, H. B. New York
 Sheriffs Mfg. Co. Milwaukee
 Superior Ship Building Co. Superior, Wis.
 Thropp & Sons Co., J. E. Trenton, N. J.
 Trigg, Wm. R. Co. Richmond, Va.
 Trout, H. G. Buffalo.

PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co. Cleveland
 General Electric Co. Schenectady, N. Y.
 Seldler-Miner Electric Co. Detroit
 Westinghouse Electric & Mfg. Co. Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mfg. Co. New York
 Clyde Machine Works Chicago
 Great Lakes Engineering Works Detroit
 Kingsford Foundry & Machine Wks. Oswego, N. Y.
 Wood, R. D. & Co. Philadelphia.

PUNCHES, RIVETERS, SHEARS.

Chicago Pneumatic Tool Co. Chicago
 Wood, R. D. & Co. Philadelphia.

REFRIGERATING APPARATUS.

Roelker, H. B. New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
 Great Lakes Register Cleveland
 Record of American & Foreign Shipping. New York.

RELEASING HOOKS FOR DETACHING BOATS.
 Standard Automatic Releasing Hook Co. New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co. Cleveland.

RANGES.

Russell & Watson Buffalo.

RIVETS—BRASS AND COPPER.

Waterbury Brass Co. New York.

RUBBER INSULATED WIRES.

Roebbling's Sons, Jno. A. New York and Cleveland.

SAFETY VALVES.

American Steam Gauge Co. Boston.
 Ashton Valve Co. Boston.
 Hayden Mfg. Co., N. L. Columbus, O.
 Lunkenheimer Co. Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co. Buffalo.
 Upson-Walton Co. Cleveland.
 Wilson & Silsby Boston.

SALVAGE COMPANIES.

See Wrecking Companies.

SCHOOLS—NAUTICAL, ENGINEERING.

Buffalo Com. & Electro-Mechanical Inst. Buffalo.
 Chicago Nautical School Chicago.
 Capt. S. W. Gould Cleveland.

SEARCH LIGHTS.

Elwell-Parker Electric Co. Cleveland.
 General Electric Co. Schenectady, N. Y.
 Seldler-Miner Electric Co. Detroit.
 Westinghouse Electric & Mfg. Co. Pittsburg, Pa.

SHEARS.

See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co. Cleveland.

SHIP BUILDERS.

American Ship Building Co. Cleveland.
 Atlantic Works East Boston, Mass.
 Baltimore Ship Building & Dry Dock Co. Baltimore.
 Bath Iron Works, Ltd. Bath, Me.
 Bell Engineering Works, David Buffalo.
 Buffalo Dry Dock Co. Buffalo.
 Cramp, Wm. & Sons Philadelphia.

Craig Ship Building Co. Toledo, O.
 Chicago Ship Building Co. Chicago.
 Detroit Ship Building Co. Detroit.
 Fore River Ship & Engine Co. Quincy, Mass.
 Great Lakes Engineering Works Detroit.
 Harlan & Hollingsworth Co. Wilmington, Del.
 Jenks Ship Building Co. Port Huron, Mich.
 Lockwood Mfg. Co. East Boston, Mass.
 Manitowoc Dry Dock Co. Manitowoc, Wis.
 Marine Construction & Dry Dock Co.
 Mariner's Harbor, S. I., N. Y.
 Marine Iron Works Chicago.
 Maryland Steel Co. Sparrow's Point, Md.
 Milwaukee Dry Dock Co. Milwaukee.
 Moran Bros. Co. Seattle, Wash.
 Neafie & Levy Ship & Engine Bldg. Co. Phila.
 Newport News Ship Bldg. Co. Newport News, Va.
 Nixon, Lewis Elizabeth, N. J.
 Pusey & Jones Co. Wilmington, Del.
 Risdon Iron Works San Francisco.
 Roach's Ship Yard Chester, Pa.
 Smith & Son, Abram Algonac, Mich.
 Superior Ship Building Co. Superior, Wis.
 Trigg, Wm. R. Co. Richmond, Va.
 Warrington Iron Works Chicago.
 Willard, Chas. P. & Co. Chicago.

SHIP CHANDLERS.

Baker, Howard H. & Co. Buffalo.
 Moran Bros. Co. Seattle, Wash.
 Rellly Repair & Supply Co., James. New York.
 Upson-Walton Co. Cleveland.

SHIP LANTERNS AND LAMPS.

Helvig, H. A. J. New York.
 Page Bros. & Co. New York.
 Russell & Watson Buffalo.

SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co. Jersey City, N. J.

SPARS—LARGE SIZES.

Moran Bros. Co. Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW, OR SOLID.

Falls Hollow Staybolt Co. Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.

Elwell, Jas. W. & Co. New York.
 Holmes, Samuel New York.
 King, Rufus S. New York.
 McCarthy, T. R. Montreal, Can.
 Newman, R. L. New York.
 Weeks, F. H. New York.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line New York.
 International Nav. Co. Philadelphia.
 Pere Marquette R. R. & S. S. Line. Milwaukee.
 Red Star Line New York.

STEEL CASTINGS.

Seaboard Steel Casting Co. Chester, Pa.
 Macbeth Iron Co. Cleveland.

STEERING APPARATUS.

American Ship Building Co. Cleveland.
 Chase Machine Co. Cleveland.
 Dake Engine Co. Grand Haven, Mich.
 Detroit Shipbuilding Co. Detroit.
 Electro-Dynamic Co. Philadelphia.
 Hyde Windlass Co. Bath, Me.
 Jenks Ship Building Co. Port Huron, Mich.
 Queen City Engineering Co. Buffalo.
 Sheriff Mfg. Co. Milwaukee.

STOCKS, BONDS, SECURITIES.

Brown, W. W. Cleveland.
 Fahey & Co. Cleveland.

SUBMARINE DIVING APPARATUS

Morse & Son, A. J. Boston.
 Schrader's Son, A. New York.

SURVEYORS, MARINE.

Goodenough, Walter New York.
 Gaskin, Edward Buffalo.
 Newman, R. L. New York.
 See, Horace New York.
 Wood, W. J. Chicago.

TESTS OF MATERIAL.

Hunt, Robert W. & Co. Chicago.
 Pittsburg Testing Laboratory, Ltd. Pittsburg.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Allen, John F. New York.
 Chicago Pneumatic Tool Co. Chicago.
 Q. & C. Co. Chicago.
 Watson-Stillman Co. New York.
 Wood, R. D. & Co. Philadelphia.

TOOLS, WOOD WORKING.

Atlantic Works, Inc. Philadelphia.

TOWING MACHINES.

American Ship Windlass Co. Providence, R. I.
 Chase Machine Co. Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co. Kingston, Ont.
 Lake Shore Stone Co. Milwaukee.
 Midland Towing & Wrecking Co., Ltd. Midland, Ont.
 Sincennes-McNaughton Line, Ltd. Montreal, Can.

TRAPS, STEAM.

Haines Co., Wm. S. Philadelphia.
 Kieley & Mueller New York.

TRUCKS.

Boston & Lockport Block Co. Boston.

TUBING, SEAMLESS.

Benedict & Burnham Mfg. Co. Waterbury, Conn.
 National Tube Co. Pittsburg.
 Waterbury Brass Co. New York.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co. Boston.
 Ashton Valve Co. Boston.
 Crane Co. Chicago.
 Farnan Brass Works Cleveland.
 Hayden Mfg. Co., N. L. Columbus, O.
 Jenkins Bros. New York.
 Kieley & Mueller New York.
 Lunkenheimer Co. Cincinnati.
 Ross Valve Co. Troy, N. Y.

VALVES FOR WATER AND GAS.

Wood & Co., R. D. Philadelphia.
 Ross Valve Co. Troy, N. Y.

VARNISHES.

Berry Brothers, Ltd. Detroit.
 Day's Varnish & Dryer Co. Cleveland.
 New Jersey Zinc Co. New York.
 Also Ship Chandlers.

VESSEL CASTINGS.

American Ship Building Co. Cleveland.
 Macbeth Iron Co. Cleveland.

VESSEL AND FREIGHT AGENTS.

Boland, John J. Buffalo.
 Brown & Co. Buffalo.
 Brown, W. W. Cleveland.
 Dunham, R. J. Chicago.
 Elwell, Jas. W. & Co. New York.
 Elphicke, C. W. & Co. Chicago.
 Hall & Root Buffalo.
 Hawgood & Co., W. A. Cleveland.
 Holmes, Samuel New York.
 Hutchinson & Co. Cleveland.
 King, Rufus S. New York.
 McCarthy, T. R. Montreal.
 Newman, R. L. New York.
 Mitchell & Co. Cleveland.
 Richardson, W. C. Cleveland.
 Sullivan, D. & Co. Chicago.
 Weeks, F. H. New York.

VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co. Buffalo.
 Sturtevant, B. F. Co. Boston.

WIRE—BRASS AND COPPER.

Waterbury Brass Co. New York.

WIRE ROPE AND WIRE ROPE FITTINGS.

Baker, H. H. & Co. Buffalo.
 DeGrauw, Aymar & Co. New York.
 Roebbling's Sons John A. New York and Cleveland.
 Upson-Walton Co. Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co. Boston.
 Ashton Valve Co. Boston.
 Farnan Brass Works Cleveland.
 Lunkenheimer Co. Cincinnati.

WHITE METAL—SHEETS, RODS AND WIRE.

Waterbury Brass Co. New York.

WINDLASSES.

American Ship Windlass Co. Providence, R. I.
 American Ship Building Co. Cleveland.
 Hyde Windlass Co. Bath, Me.
 Jenks Ship Building Co. Port Huron, Mich.

WINCHES.

American Ship Windlass Co. Providence, R. I.
 Hyde Windlass Co. Bath, Me.

WOOD WORKING MACHINERY.

Atlantic Works, Inc. Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co. Kingston, Ont.
 Lake Shore Stone Co. Milwaukee.
 Midland Towing & Wrecking Co., Ltd. Midland, Ont.

YACHT AND BOAT BUILDERS.

Bell Engineering Works, David Buffalo.
 Dreln, Thos. & Son Wilmington, Del.
 Gas Engine & Power Co. New York.
 Lane & DeGroot Long Island City, N. Y.
 Marine Construction & Dry Dock Co. New York.
 Marine Iron Works Chicago.
 Truscott Boat Mfg. Co. St. Joseph, Mich.
 Warrington Iron Works Chicago.
 Willard, Chas. P. & Co. Chicago.

YAWLS.

Dreln, Thos. & Son Wilmington, Del.
 Lane & DeGroot Long Island City, N. Y.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

Allen, John F.	11	Delaware River Iron S. B. & E. Works.	5	Lake Erie Boiler Works.	14	*Reilly Repair & Supply Co., Jas. S.	8
Allen, Joseph	13	Detroit Electric Signal Co.	6	Lake Shore Engine Works.	8	Risdon Iron Works	5
Almy Water Tube Boiler Co.	15	Detroit Ship Building Co.	1	Lake Shore Stone Co.	45	*Ritchie & Sons, E. S.	13
American Line	3	Dixon Crucible Co., Joseph.	12	Lang, Sydney B.	47	Roach's Ship Yard	5
American Ship Building Co.	1	Donnelly Salvage & Wrecking Co. 7		Lane & DeGroot	4	Roberts Water Tube Boiler Co.	15
American Ship Masters Ass'n.	6	Drein, Thos. & Son.	4	*Learmonth, Robert	13	Rochester & Pittsburg Coal & Iron Co.	39
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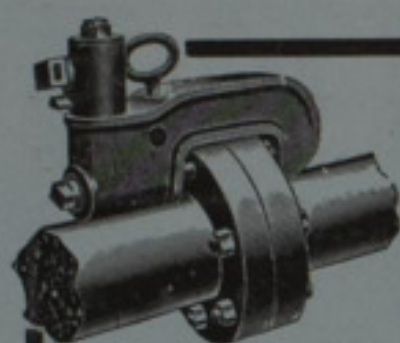
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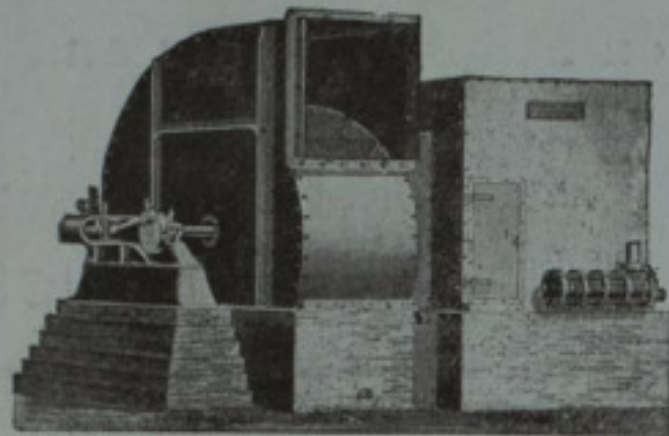
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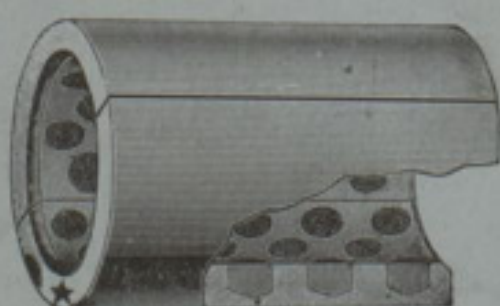
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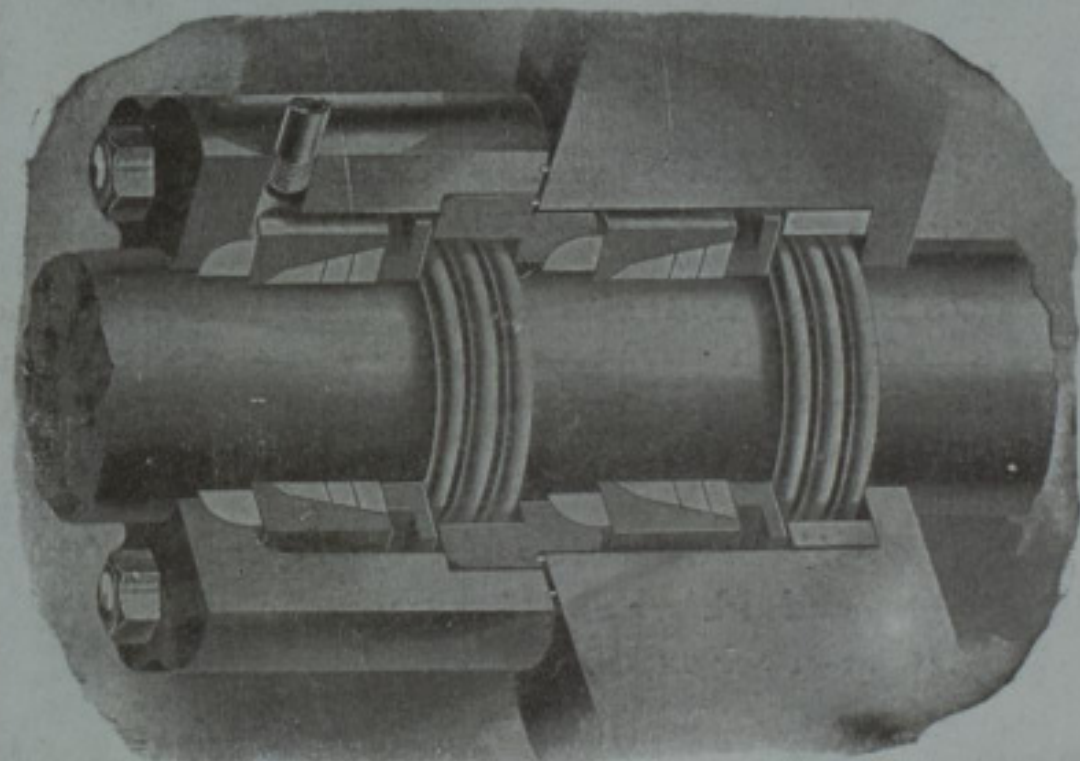
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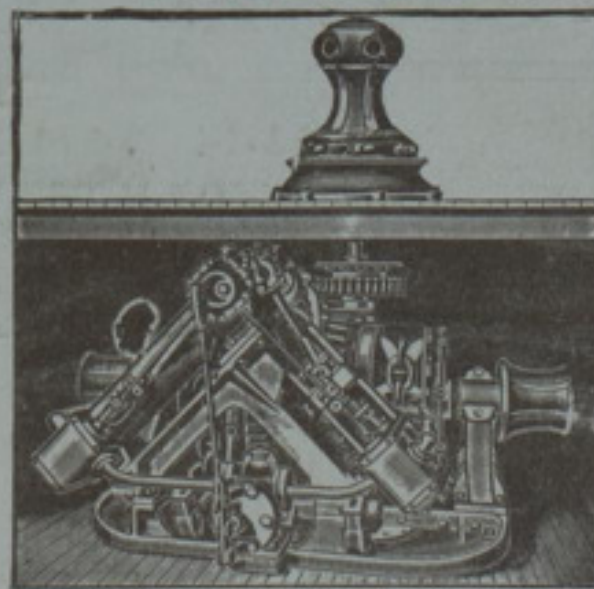
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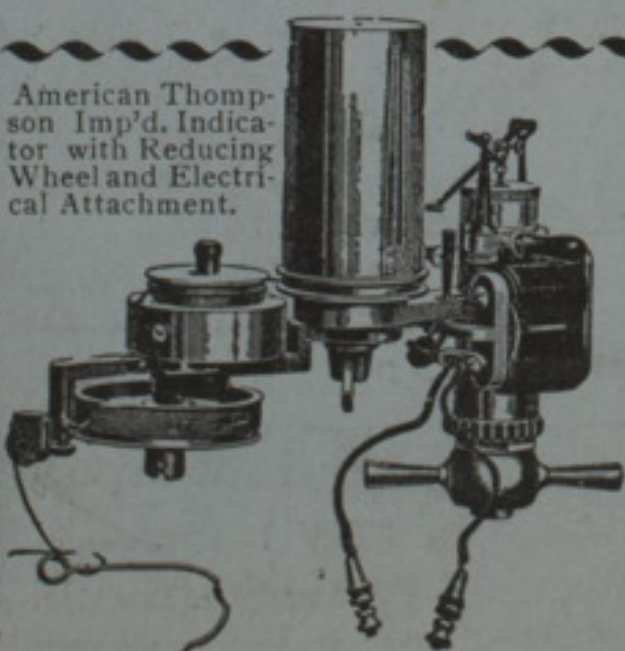
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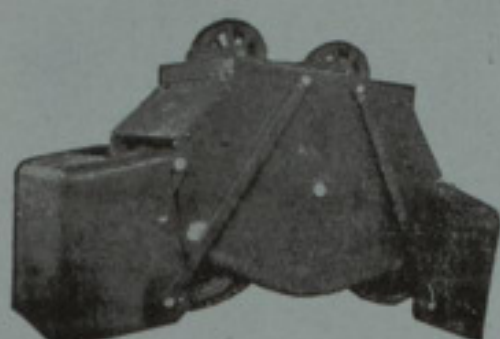
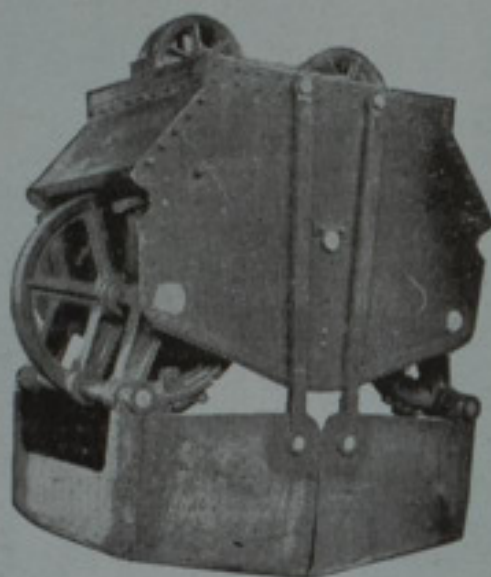


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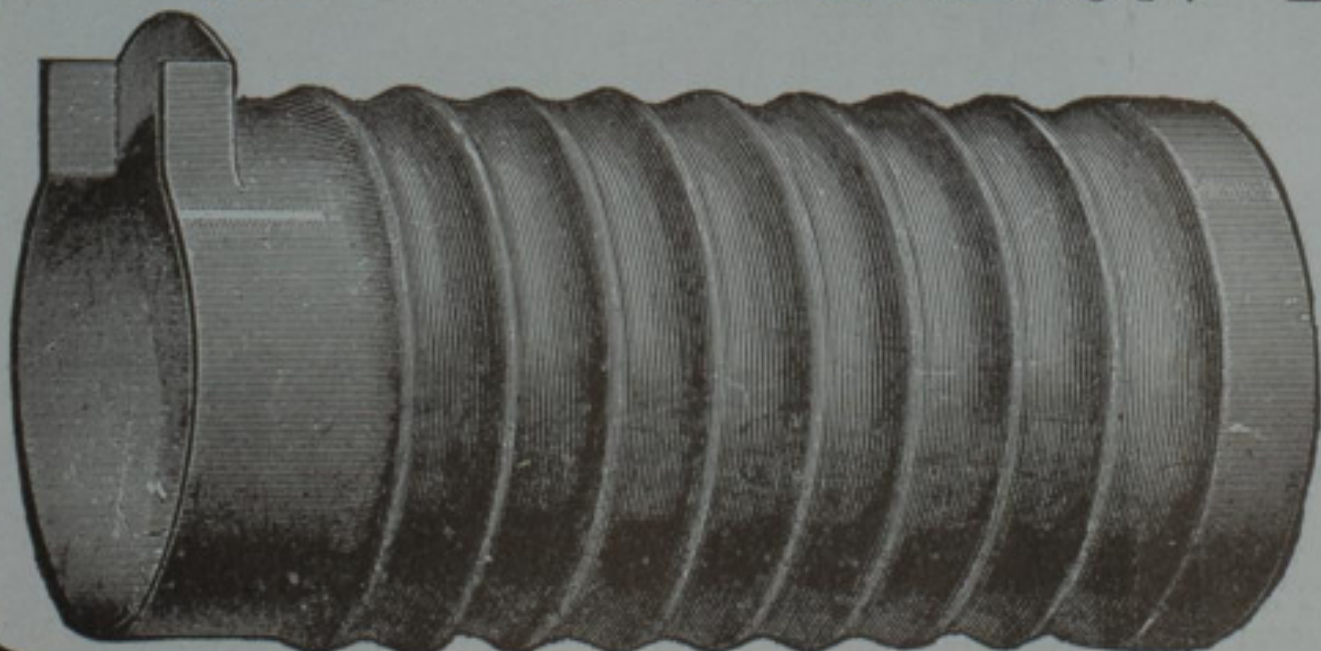
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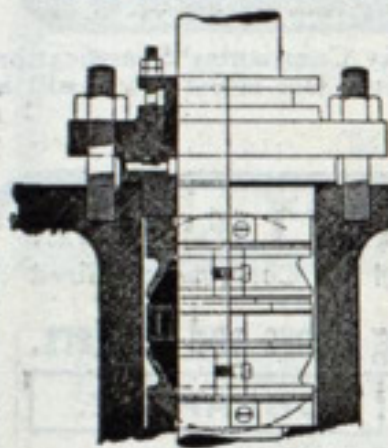
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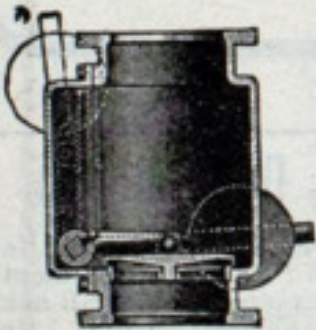
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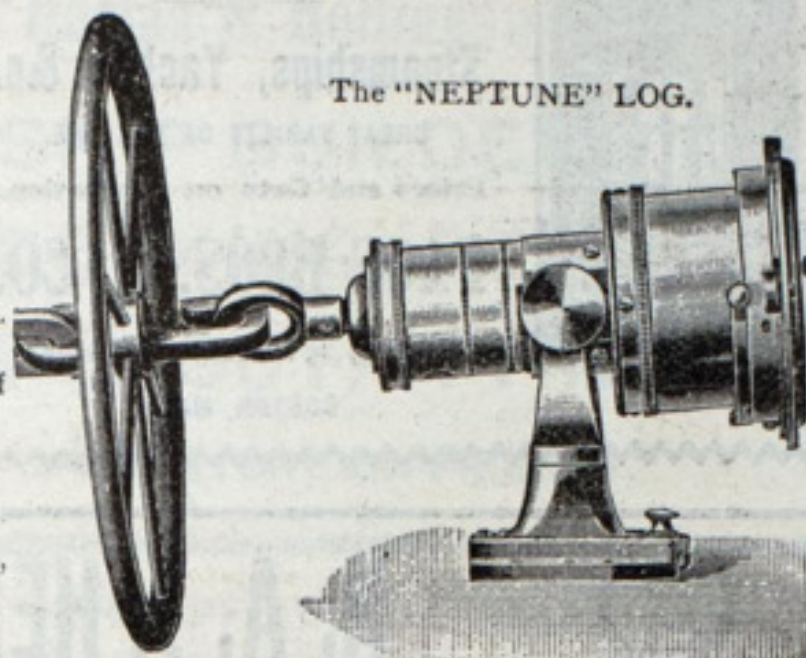
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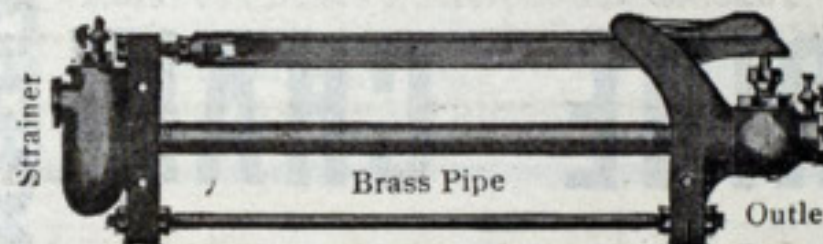
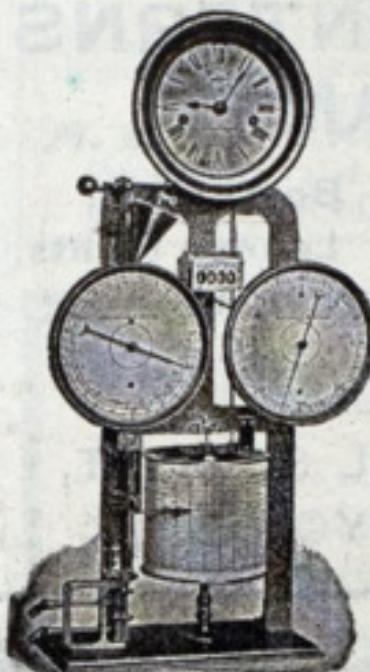
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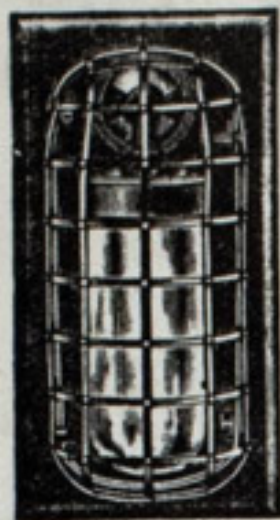
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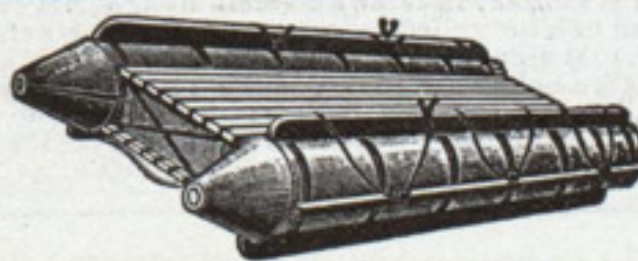
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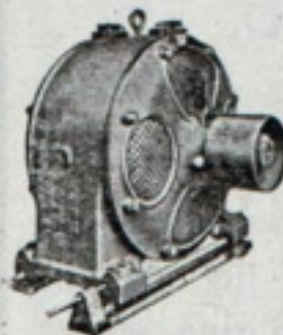
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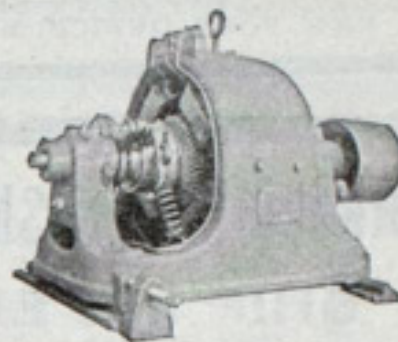
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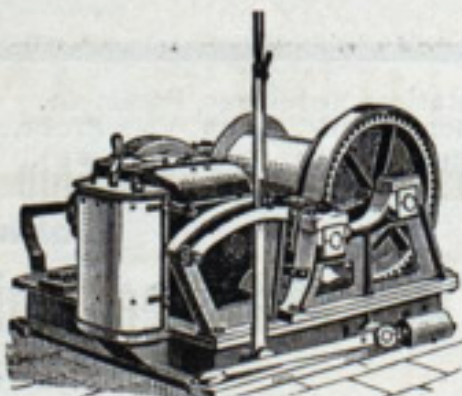
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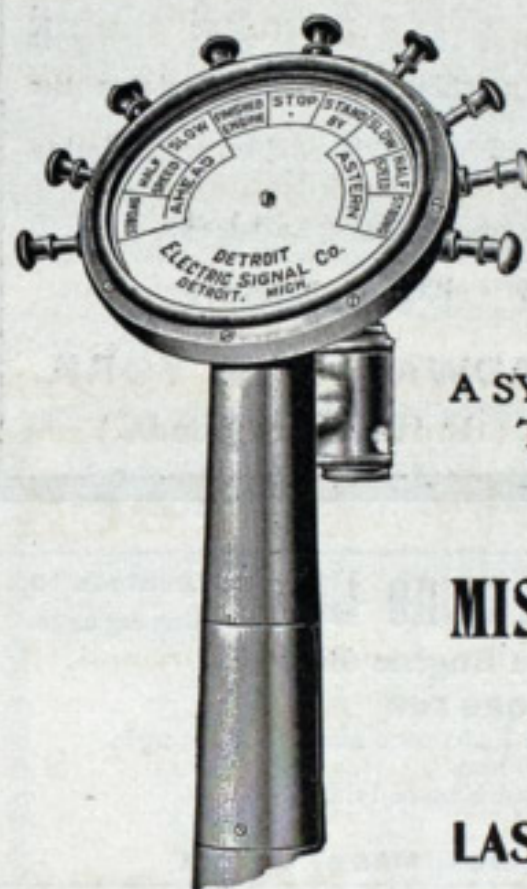
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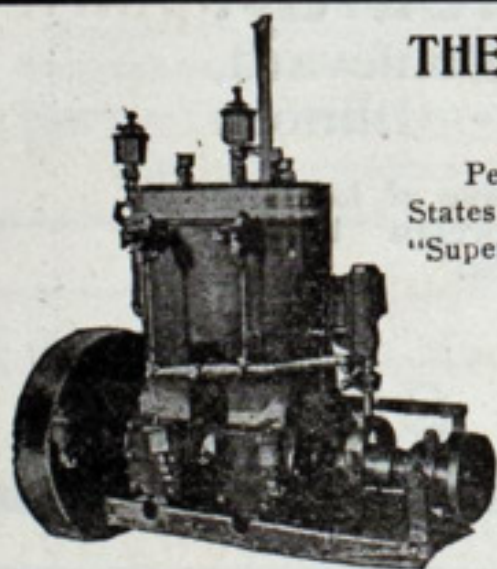
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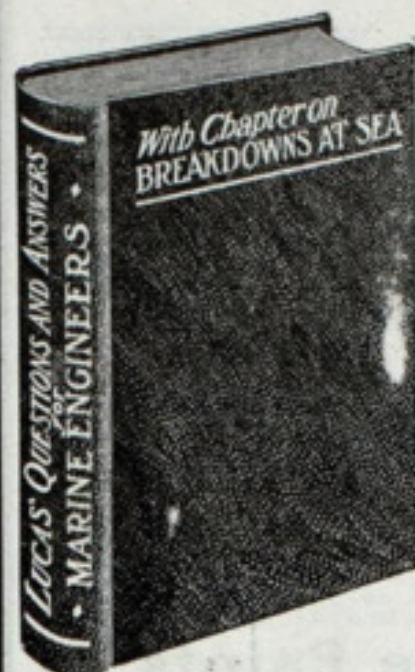


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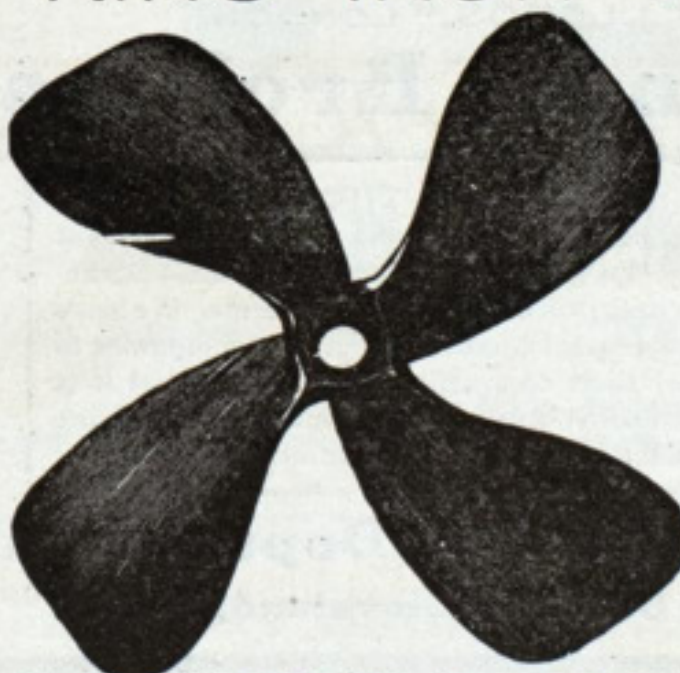
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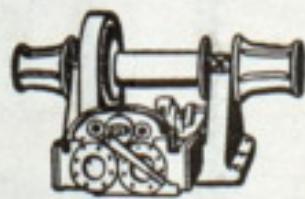
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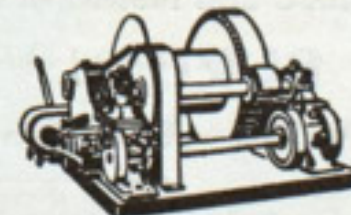
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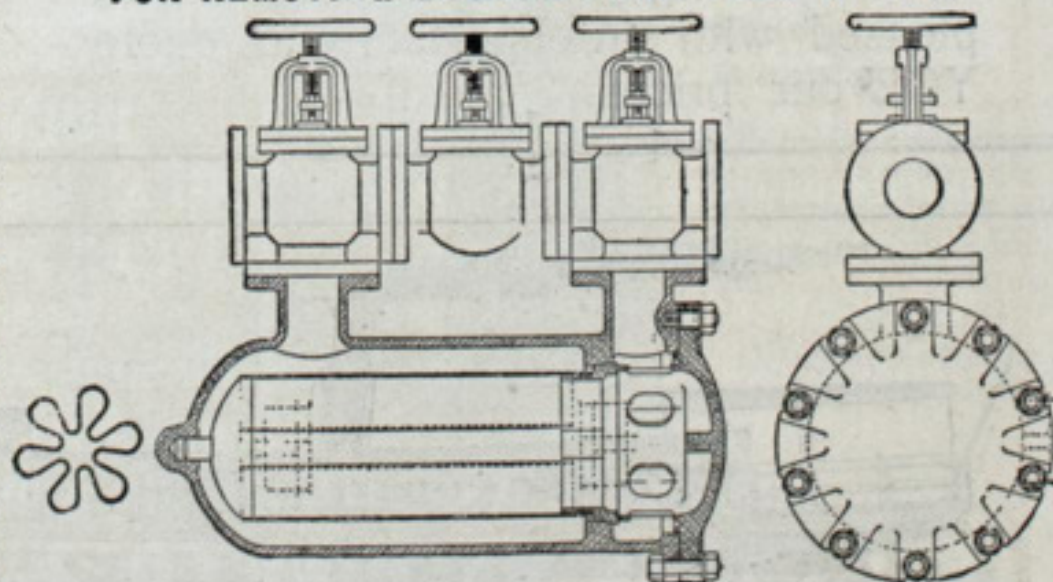
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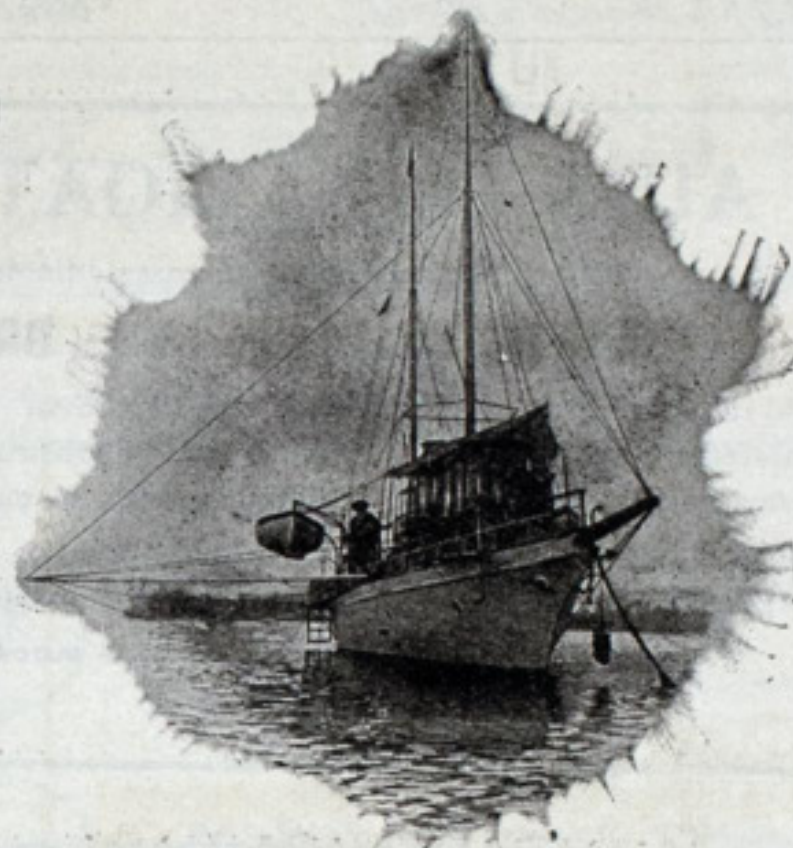
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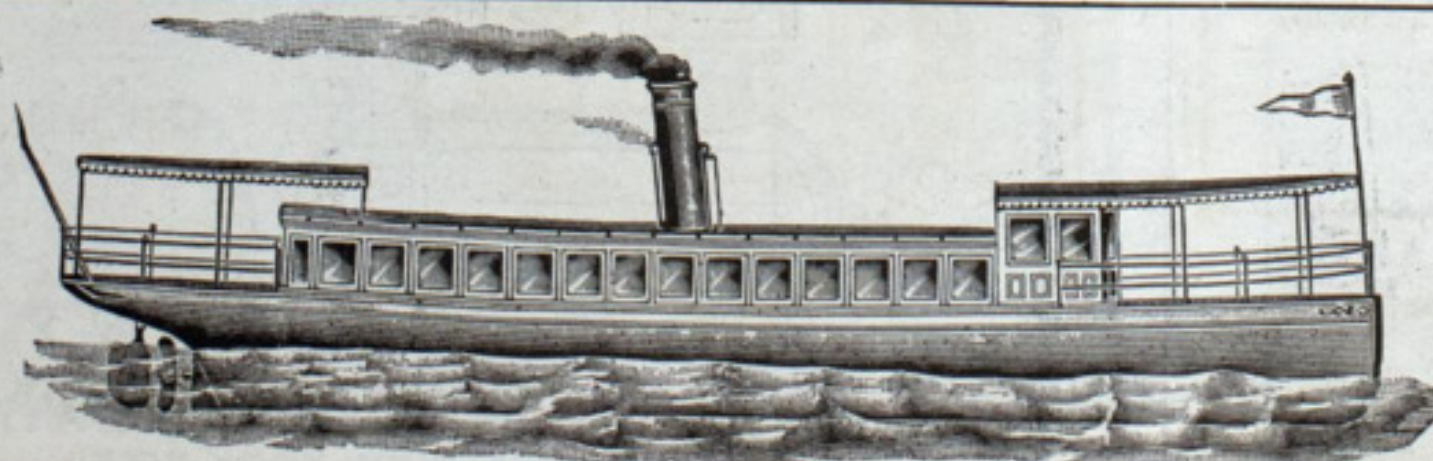
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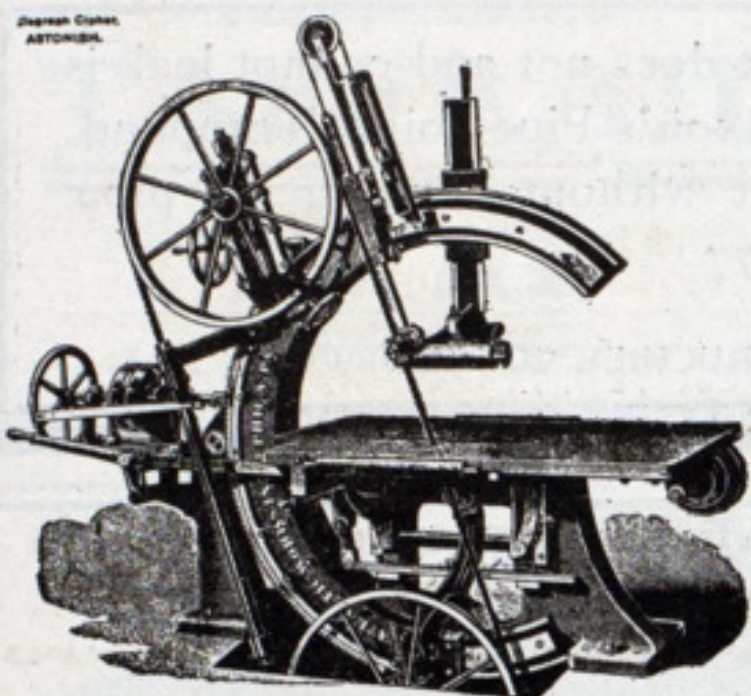
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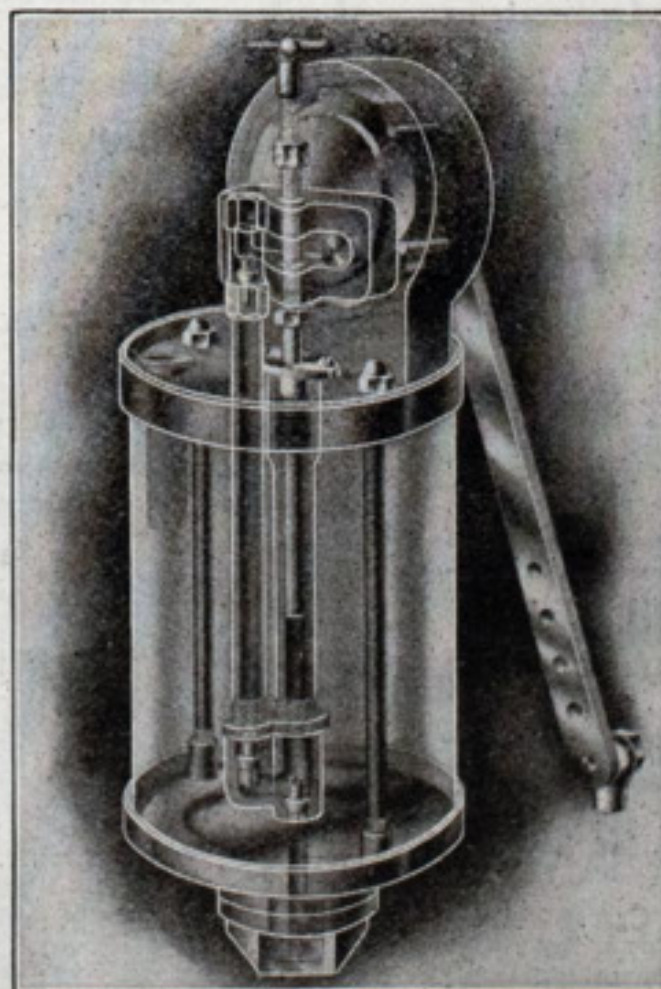
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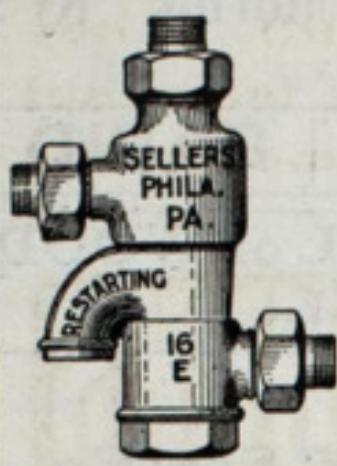
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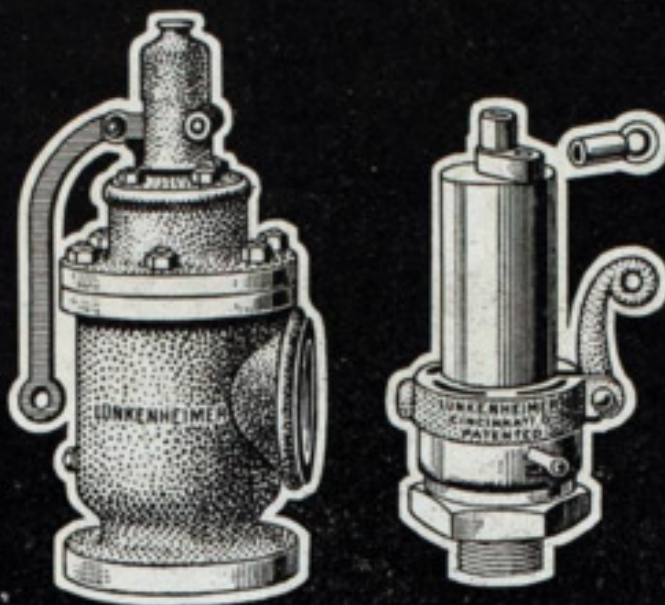
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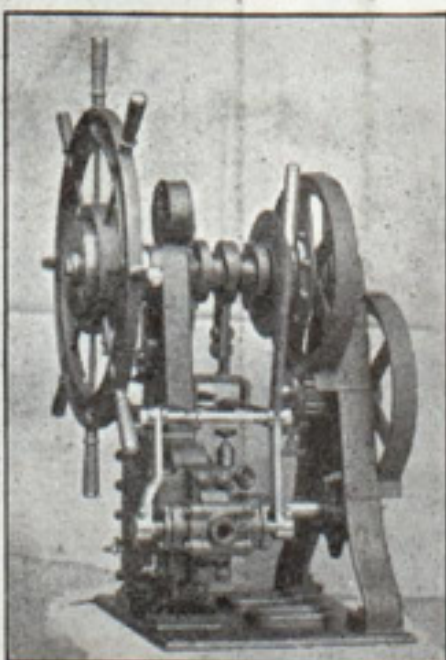
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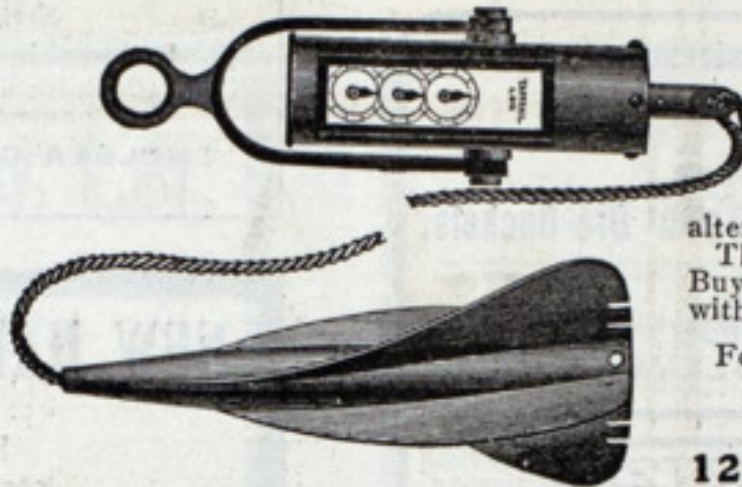
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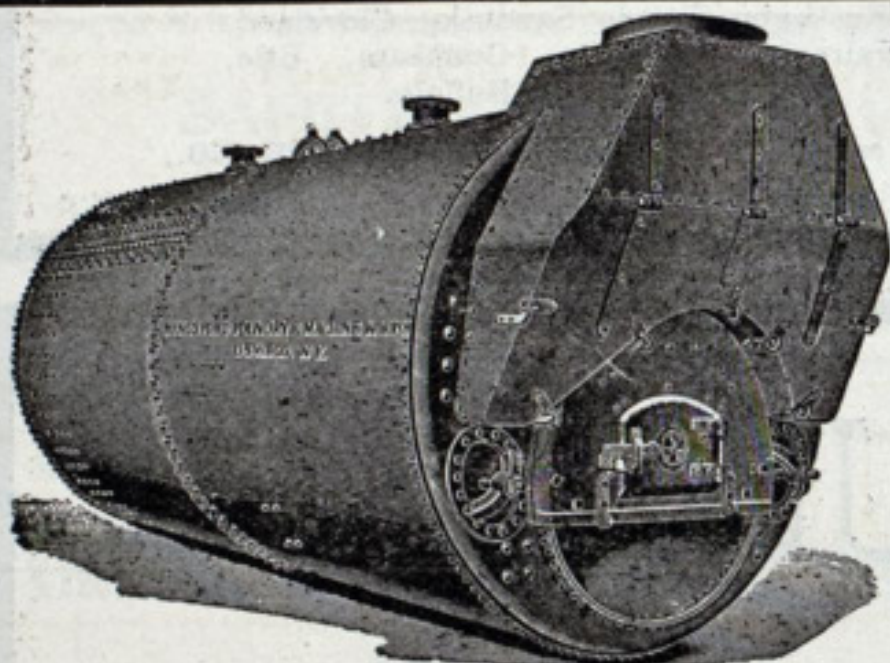


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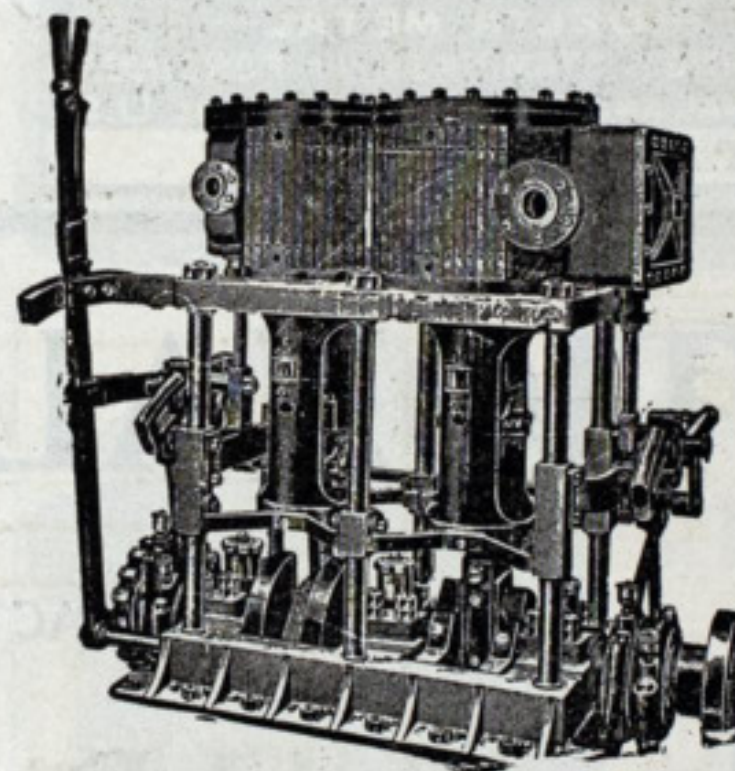
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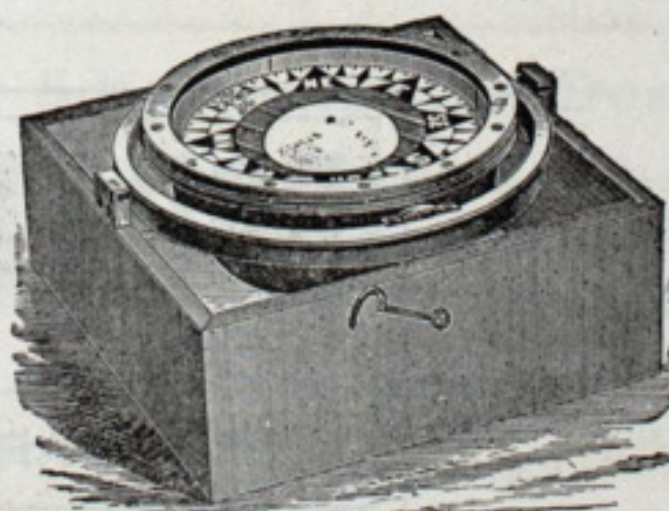
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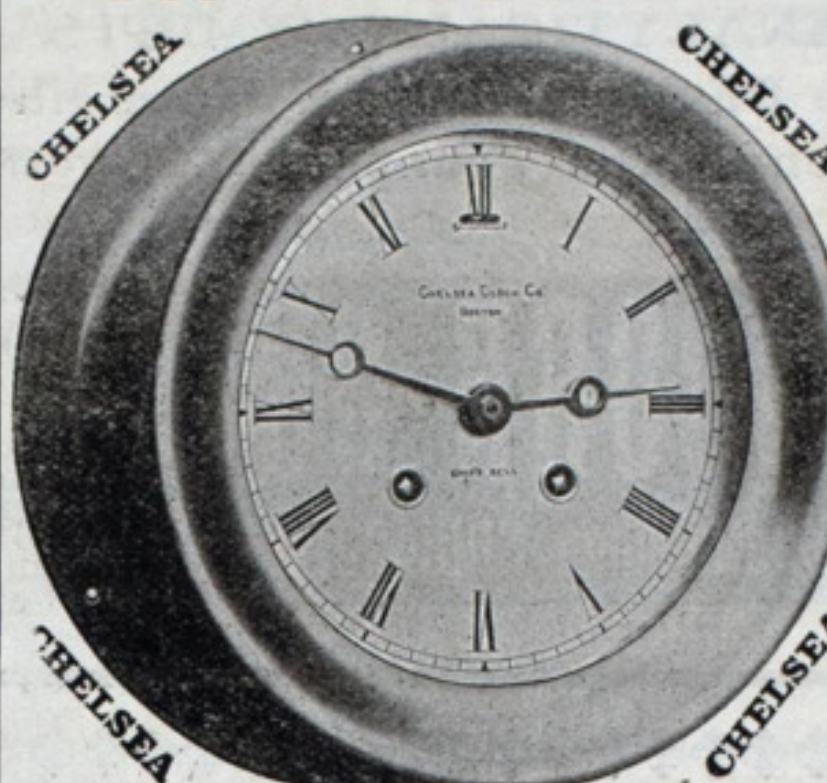
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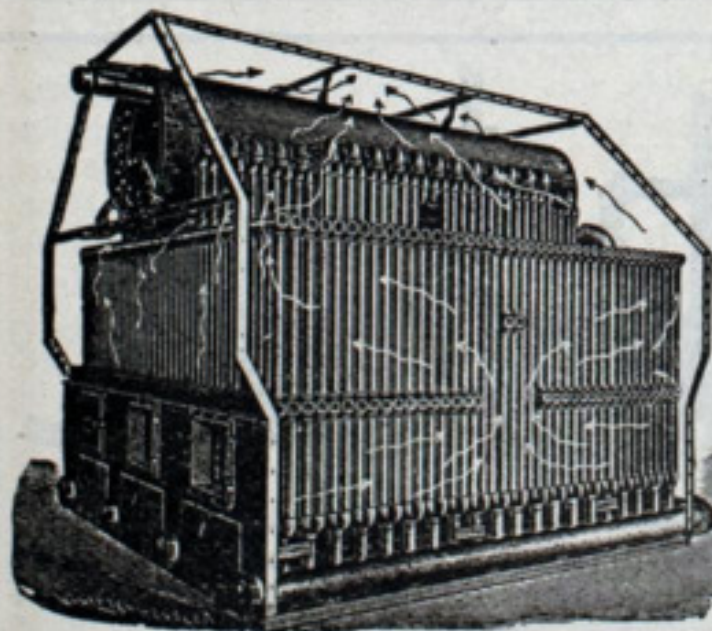
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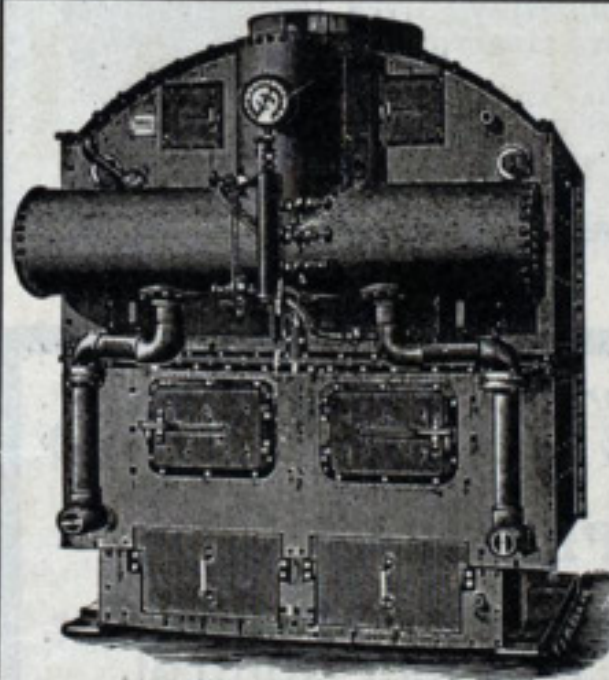
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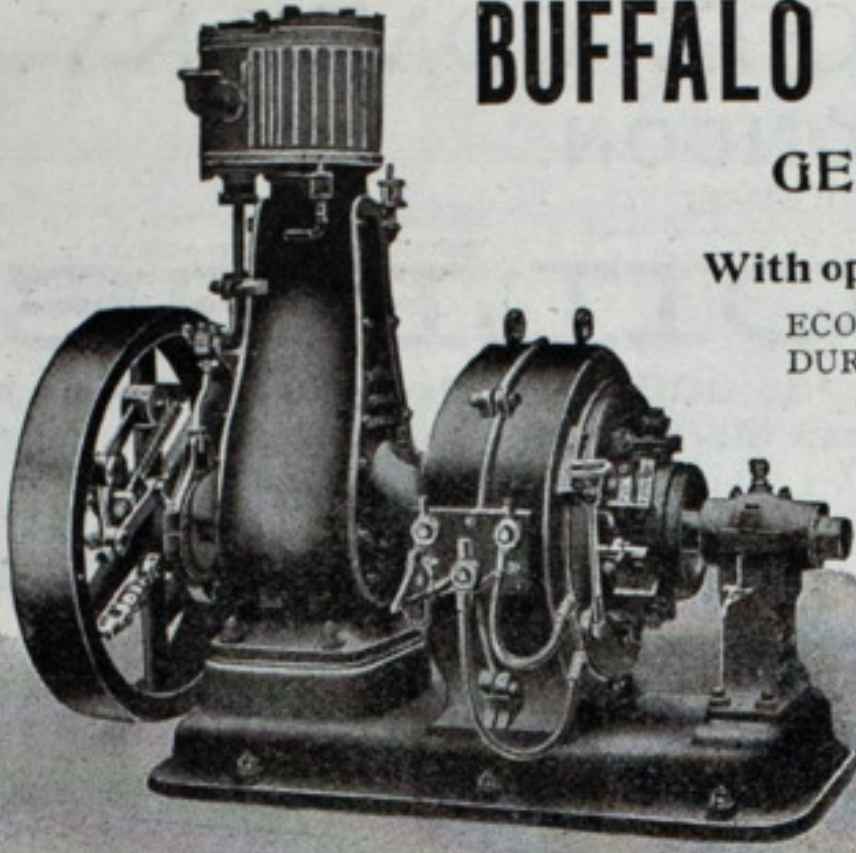
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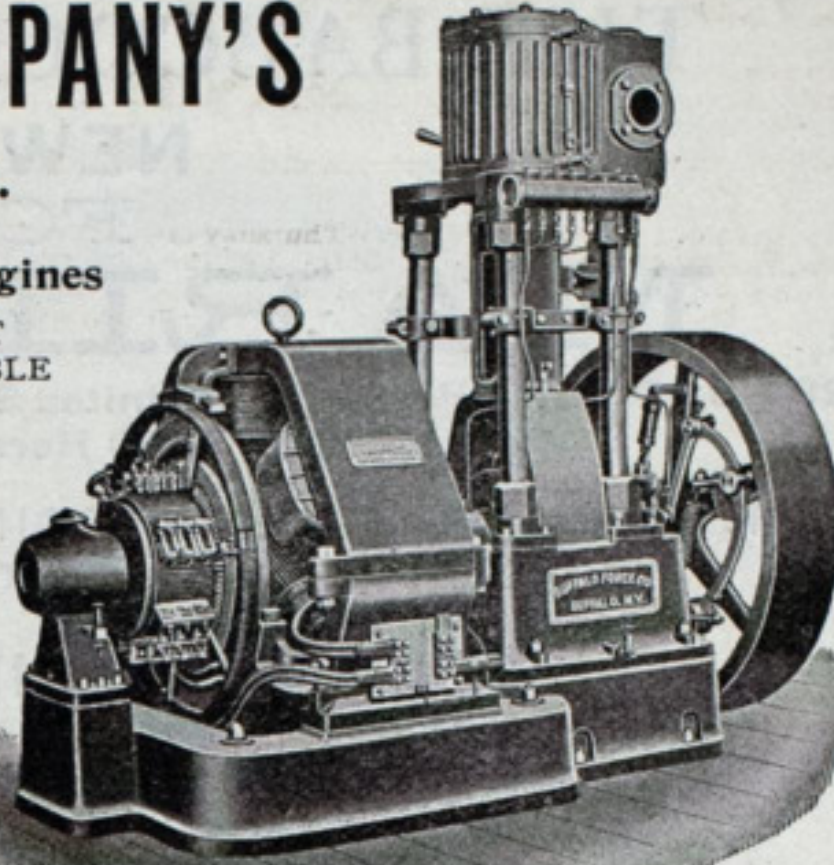
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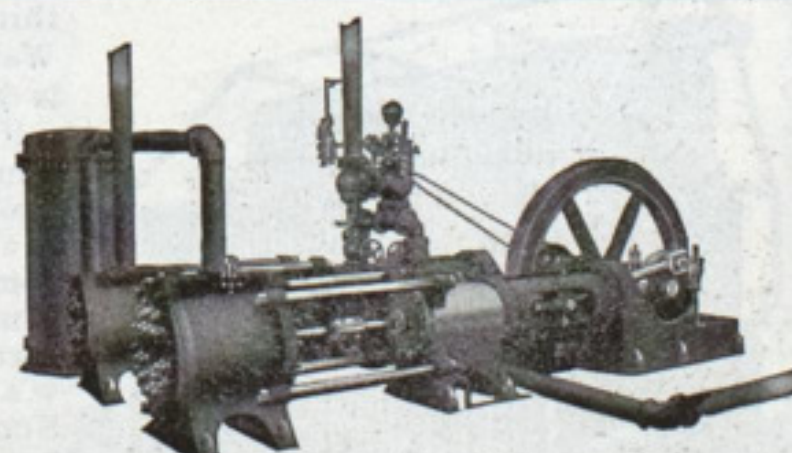
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